THE
RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer · TRANSPORT · The Railway News
The Railway Times · Herapath's Railway Journal · THE RAILWAY RECORD.
RAILWAYS ILLUSTRATED · ESTABLISHED 1835 · THE RAILWAY OFFICIAL GAZETTE

PUBLISHED EVERY FRIDAY
AT
33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1

Telegraphic Address: "TRAZETTE PARL., LONDON"
Telephone No.: VICTORIA 8836 (6 lines)

Annual subscription payable in advance and postage free:
British Isles and Abroad.....£2 5s. 0d.
Single Copies.....One Shilling
Registered at the General Post Office, London, as a Newspaper

VOL. 63. No. 10 FRIDAY, SEPTEMBER 6, 1935

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DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue

Celebrating the G.W.R. Centenary

AMONG the many pleasant features of the G.W.R. centenary celebrations last week-end was the full recognition, not only by the participants but also by the press, of the unique nature of the event. Never before in the history of the railways of Great Britain—the birthplace of this means of locomotion—has a main-line railway company attained to the dignity of a full hundred years of corporate life. There are, of course, older railways than the G.W.R., but the process of amalgamation (almost as ancient as railways themselves) has always resulted in a loss of identity long before ten decades of life were run. Nor is the G.W.R. record in this respect likely to be challenged within living memory, as the Railways Act of 1921 left only the G.W.R. of all the main-line companies to continue operating under the original charter. In its long life under the familiar title the G.W.R. has deservedly gathered a wide circle of friends, and Lord Greenwood expressed this sentiment happily in a letter which Sir Robert Horne quoted at Bristol on Saturday when he said "All England seems to have a friendly family feeling for the Great Western." Moreover, this enthusiasm received further justification on Saturday in the flawless manner in which the events recorded on pages 383-7 were carried out.

* * * *

The Bristolian

A centenary celebration of a very practical kind has been devised by the Great Western Railway management. It consists of an entirely new daily service from Paddington to Bristol and back, faster than any which has previously connected the two cities. In 1841 the best London-Bristol time was 4 hr. 25 min.; twenty years later it had fallen to 3 hr. 5 min., and by 1881 to 2 hr. 36 min.; by 1901 the journey was accomplished in 2¼ hr., and in 1903 the 2-hr. schedule which has since remained standard for three decades—except during the war period—was introduced. Only for a brief period during 1932 and 1933, when the 11.15 a.m. and 1.15 p.m. down were accelerated to 118 and 116 min. respectively, has any faster time appeared in the G.W.R. timetables, but the substitution of a 3 min. stop for slip coaches at Bath on both these trains resulted in a restoration of the 2-hr. booking. Now present-day speed enterprise, from Monday next, cuts the best time to 1¾ hr., requiring an average speed of 67·6 m.p.h. on the down journey, via Bath, of 118·3 miles, and 67·2 m.p.h. in the reverse direction, over the 117·6 miles via Badminton. The latter train will require to maintain the high average speed of 79·5 m.p.h. for 68·2 miles from Swindon to Southall. The new service is to be named the Bristolian, and the times arranged—at 10 a.m. from Paddington, returning at 4.30 p.m. from Bristol—should prove very convenient to business men.

* * * *

The Week's Traffics

Thanks to good passenger train traffics all the four group railways for the past week show a net improvement, which for the four companies together amounts to £25,000. For the year to date the aggregate traffics of the four companies combined reach £101,373,000, an increase of £848,000 or 0·84 per cent. Passenger train traffics of the four companies together for the 35 weeks amount to £46,957,000, an increase of £1,162,000 or 2·54 per cent. Merchandise receipts for the year to date show a net decrease of £18,500, as although the L.M.S.R. has an increase of £65,000 and the Great Western one of £50,000, the L.N.E.R. still has a small decrease (£6,000) and the Southern is £127,500 behind.

	35th Week				Year to date.	
	Pass., &c.	Goods, &c.	Coal, &c.	Total.	Inc. or Dec	
	£	£	£	£	£	%
L.M.S R. ..	+ 15,000	+ 3,000	− 7,000	+ 11,000	+ 463,000	+ 1·15
L.N.E.R. ..	+ 10,000	+ 2,000	− 7,000	+ 5,000	+ 103.000	+ 0·35
G.W.R. ..	+ 10,000	− 2,000	− 4,000	+ 4,000	+ 150.000	+ 0·89
S.R	+ 10.000	− 4,000	− 1,000	+ 5,000	+ 132 000	+ 0·96

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Speed and Comfort

That very high speed on a railway journey is against the interests of the man who travels on business is a novel proposition put forward by Sir John A. R. Marriott in a letter published in *The Times* on Tuesday. "What does it avail a busy man," he asks, "to save 20 minutes on the two hours' journey from London to Bristol if he thereby loses the chance of doing two hours' good work on the way?" Sir John Marriott himself takes by preference a slower train in which he can read, write, and think, as it is impossible for him to do these things in a G.W.R. flyer. Most business men, we think, would prefer to save the 20 minutes on the journey in any event, even those who are accustomed to work out their problems while travelling. Moreover, it does not seem to us that the average man would find any more difficulty in doing his work on a high-speed than on a more deliberately-

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paced train, since the smoothness of travel is, if anything, greater on the faster train where track and rolling stock are in first class condition. To most business men time is the essential thing, and in the past the popularity of the old Midland Railway was very great with regular travellers between London and Manchester, Leeds, Sheffield, and other business centres in that it specialised in fairly high speeds, good catering, courteous attendance, and great passenger comfort.

* * * *

Burma Railways

The Burma Railways, constructed by the State and worked by a company from 1896 until the end of 1928, have been worked by the State since January 1, 1929. They consist of 2,060 route miles on the metre gauge of which 1,853 miles are single track and 207 miles are double, trebie, &c. Paddy (rice) forms the principal item of goods traffic, and it is disturbing to learn that some 500,000 acres of land under rice in the districts served by the railway are being relinquished by owners as unprofitable to work at the prevailing prices of produce. There are, however, indications of an improvement in other items of traffic. For the year ended March 31, 1935, on which the report has recently reached us, there was an increase in gross earnings of Rs. 11,85,323, and in net earnings of Rs. 7,72,110.

	1934–35	1933–34
Passengers	20,736,081	20,329,736
Tons (public traffic)	3,121,273	2,916,867
Train-miles	7,413,467	7,072,342
Net ton-miles	676,484,387	624,779,391
Operating ratio, per cent.	75·4	76·7
	Rs.	Rs.
Passenger receipts	88,42,173	86,59,184
Public goods receipts	2,50,95,202	2,36,58,137
Gross earnings	3,78,32,623	3,66,47,300
Working expenses	2,85,11,843	2,80,98,630
Net earnings	93,20,780	85,48,670

Net earnings represent a return of 2·70 per cent. on total capital at charge, against 2·47 per cent. in 1933-34, but they have not met interest liability in full since 1929-30, when the return was 5·38 per cent.

* * * *

Census of Railway Staff

A return of staff employed by the railway companies of Great Britain and on the railway undertakings of the London Passenger Transport Board was issued on Wednesday by the Ministry of Transport. The total number employed during the week ended March 9, 1935, was 580,766, an increase of 5,718 or 1 per cent., compared with that for the week ended March 10, 1934. Though the number of male staff advanced from 553,041 to 558,033, and the increase in the female staff was from 22,007 to 22,733, the total 1935 figure is less than that for March, 1932, when there were 575,864 male and 22,107 female employees. Of the net increase of 4,992 in the number of male staff employed in March, 1935, as compared with March, 1934, 4,981 was in railway staff and 11 in the staff engaged in ancillary businesses. The fall in the number of officers and of clerical staff and of certain supervisory staff which had been so noticeable in the past few years has been arrested. Officers, for instance, number 1,998 against 1,999, and the number of stationmasters (4,346) is the same as in 1934, but the number of male clerical staff has risen from 60,335 to 60,820. Engine-drivers and motormen have increased from 33,265 to 33,523, firemen and assistant motormen from 30,624 to 30,663, and engine cleaners from 7,970 to 8,285. There are 13,535 goods guards in 1935 against 13,311 in 1934, but passenger guards number 7,307 compared with 7,308. The return gives the total amount of salaries and wages paid for the year 1934 as £99,385,000 compared with £96,557,000 in 1933.

* * * *

Mechanical Horses

In recent years there have been frequent pleas for the elimination of horse-drawn traffic from the congested streets of central London, and at the beginning of last month the Minister of Transport added his support and announced that he was in communication with the largest users of horse-drawn vehicles with a view to obtaining, amongst other things, the acceleration of their replacement by mechanically-drawn units. For some years past the railways have done much to improve both their own services and road conditions in the principal cities by the extensive replacement of "flesh-and-blood" horses by their mechanical counterparts. On our Contracts and Tenders page this week we summarise particulars of further orders given by the four group railways to a single firm during the past month for 258 mechanical horses and 588 trailers. This early response should prove heartening to Mr. Hore Belisha in his endeavours to speed up the movement of traffic in congested areas. It may be taken also that the policy of mechanisation will reflect itself favourably in an increased popularity for railway freight transport.

* * * *

A Pennsylvania Travel Record

Figures recently issued by the Pennsylvania Railroad indicate that the greatest number of excursion passengers handled in one day by the railway since December, 1931, moved over the Central Region on July 7, the Sunday following Independence Day. Excursion passengers conveyed on regular trains totalled 4,876, and 2,634 passengers were handled on extra trains. The density of this excursion traffic was greatest between Pittsburgh and New York, in which 1,525 passengers took advantage of the low rates to visit friends and see America's commercial metropolis. Passenger traffic has risen sharply on all points of the railroad, due to the speeding up of passenger trains and the installation of air-conditioning equipment. Another contributing factor is believed to be the growing appreciation on the part of the general public of the convenience, comfort, economy, and, above all, the outstanding safety of rail travel. The total of passengers carried by the Pennsylvania Railroad in 1934 showed a considerable gain as compared with 1933, the figures being 55,582,000 as compared with 52,890,000 in the preceding twelve months.

* * * *

The L.M.S. in Scotland

From the passenger's point of view, a noticeable improvement of L.M.S. services north of the border during the last twelve months or so has been the much better punctuality of trains. No doubt the punctuality campaign, so energetically waged of late, is largely responsible, but without the recent remarkable improvement in motive power, it could not have been so effective. A revolution is in progress in the locomotive department. Where, scarcely a year ago, Midland compounds, often in couples or with an old Caledonian helper, struggled manfully with the heavy summer loads, today Mr. Stanier's brisk maids-of-all-work hustle, almost without effort and mostly without assistance, astonishing loads for their size—and *gain* time. On the Highland Section these ubiquitous 4-6-0's prevail, and the former stars of that line, the "Clans," are all departed to make things better on the tortuous Callendar and Oban railway. Further south, the

three-cylinder Stanier engines and "Royal Scots," lately reinforced by the Pacifics, are bearing the punctuality standard. So regret at the encroaching oblivion of the old Scottish engines is tempered by the better business of the new. And hope, stimulated by this punctuality boom, will surely not much longer be deferred that the bookings of the trains will themselves soon be smartened up.

* * * *

Standard Uniforms in Germany

After the formation of the German State Railway in 1920 it became necessary to institute a standard uniform for the staff, the previous individual State systems having had their own distinctive designs. Discussions lasted till 1924 and two styles of uniform were agreed on, one with a single-breasted, the other with a double-breasted jacket, both with high collars. Marks indicative of grade were carried on the jacket only, not on the overcoat. The general effect was not very attractive and the standard uniform did not meet with a good reception. An agitation for it to be modified gained ground after the present regime was inaugurated, and at last a new design has been accepted, and came into force on July 18. To judge from photographs its appearance is distinctly pleasing. The double-breasted style has been given up and the new jackets can be had with a high or an ordinary collar, at the wish of the wearer. In the latter case a white, or a white and blue, shirt must be worn, with white collar and black tie. The cloth is dark blue and the buttons dull gold. The cap carries the national badge with a black, white, and red cockade. The marine services are not affected but the new uniform applies to the national road motor service. The grades obliged to wear uniform remain as before but some additional ones may also wear it now, if they wish. It is hoped that this will tend to increase the justifiable pride which employees feel in belonging to the undertaking.

* * * *

A Public Road Level Crossing Accident

Recent concern with accidents at occupation level crossings has tended to divert attention from the possibility of such occurrences at public road crossings. An example of the latter, on January 24 last, was inquired into by Colonel Trench, whose report is summarised on page 390 herein. In gauging the rarity of such mishaps it should be remembered that, according to figures furnished by the railway companies to the Ministry of Transport, there are 4,567 such crossings and yet, including the present case, there have been only six accidents at public road crossings inquired into since the opening of the present century. More remarkable still is the fact that all these have happened within the last ten years. Moreover, two of these six—Fawley on November 15, 1926, and Jacob's Gutter Lane on July 26, 1933—occurred on light railways where exemption had been given to the provision of gates. Then, at Fenny Stratford on December 6, 1925, a motor vehicle burst into the closed gates of the crossing and fouled the main line. We are thus left with only two other cases, apart from the present one, during a period of at least 35 years —and possibly longer—where it has been considered necessary to inquire officially into cases of road vehicles being run down by trains at public road level crossings protected by gates. In all these three cases the gates were worked by hand by a gateman; *i.e.* they were not actuated from a signal box; and were not protected by, and interlocked with, the running signals. The other two were at Naworth on August 30, 1926, and Roudham on October 27, 1926.

Level Crossing Gates

It was in the time of William IV that the first legislation as to public road level crossing gates was passed. In 1835 it was ordered that "where a railroad shall cross a highway the proprietors of the railroad are to provide, make and maintain good and sufficient gates at each side of the crossings." In 1839 this Act was verbally amended so as to provide for "good and sufficient gates across each end of such turnpike." After the Act of 1871, which extended the powers of the Board of Trade as to the inspection of railways, was passed, the Board of Trade Requirements as to new railways were revised and enlarged but the essentials as to level crossings were exactly those mentioned above. Later, this requirement was widened and said that the gates "must be so hung as not to admit of being opened outwards towards the road." The gates at Naworth, Roudham and Honington, mentioned in the preceding note, did not comply with that requirement but they had been in use since 1836, 1845 and 1853 respectively which was before the requirement was set up. As a matter of some little historical interest in these later years, we should say that the requirements of 1892 made a preference of single gates on each side to double gates. This presumably was in order to give the gateman less work to do and so to complete more quickly the opening or closing of the gates. The working of the gates simultaneously from the signal box—invented by C. H. Lea, of Stafford, in 1863—made it desirable that the weight to be moved should be reduced, which led to the gates being in two pairs, all four working together. Now, today, there is no requirement as to the form of public road level crossing gates, but for "field, private, and occupation road level crossings, single gates should be used. They should be hung so as to open away from the railway line."

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Water Softening on the L.N.E.R.

The treatment of boiler feed water is one of the most important influences on locomotive operation, and recognition of this fact is further confirmed by the work now proceeding on the L.N.E.R. of installing twenty-two new water softening plants at various points on the system. Thirteen of the plants are being located between King's Cross and Doncaster and the remaining nine on the Great Eastern Section. The plants have capacities ranging from 5,000 to 40,000 gallons an hour. The characteristics of the water vary considerably in different districts. In the Scottish Area, for instance, the waters generally contain little scale-forming material, whilst in the North-Eastern Area they are intermediate in quality. In the Southern Area hard waters are the rule, and this accounts for the installation of so large a proportion of the plants between London and Doncaster, a distance of 156 miles. Statistics compiled by the company's engineers and chemists provide interesting reading as, for instance, the fact that the engine of the Flying Scotsman evaporates about 14,000 gallons of water between King's Cross and Edinburgh, and this water, picked up at various points *en route* in its raw condition, contains approximately 35 lb. of scale-forming material, whilst scale aggregating to several cwt. is found in the boiler of an engine after 50,000 miles of service in a hard water district. When the present schemes are completed a total of 40 plants in the North Eastern and Southern Areas of the L.N.E.R. will have a combined capacity of 3,000 million gallons of water a year, and scale formation to the extent of about 4,000 tons per annum will be prevented. This matter is further dealt with in an illustrated article on page 380 of the present issue.

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Austrian Federal Railways

THE improved economic situation in Austria, which has been brought about, in spite of the political disturbances in February and July last year, by trade agreements and work producing schemes, has resulted in a slightly brighter tone appearing in the annual report of the Austrian Federal Railways for 1934 than has been seen for some time. The improvement observable is not great and cannot be so until certain conditions are altered considerably, of which at present there appears little prospect, but if it can be maintained the difficulties with which the management has so long been contending should be appreciably diminished. The working results were as follow:—

	(Millions of Schilling)		Difference, Per cent.
	1934	1933	
Passenger and parcels receipts	138·8	151·9	− 8·7
Goods receipts	271·3	265·7	+ 2·1
Total operating receipts ..	410·1	417·6	− 1·8
Various receipts..	16·3	21·6	−24·6
Total working receipts ..	426·4	439·2	− 2·9
Working expenditure	446·5	465·0	− 4·0
Working deficit	20·1	25·8	−21·8
Total loss, excluding depreciation, &c.	68·0	85·6	−20·6
Total loss, including same ..	72·7	103·1	−29·5

These figures do not appear very encouraging, the only rise being in goods receipts, but the decline under most headings is at a lower rate than in previous years. The reductions in passenger fares have not had the desired effect of arresting the fall in receipts, which fell from 28,897 S. per km. to 26,414 S., and per train-km. from 4·86 S. to 4·28 S. The number of passengers carried declined from 60 to 55·5 millions (7·5 per cent.), passenger-km. from 2,284 to 2,107 millions, or 7·7 per cent. The average journey per passenger was 38·0 km., against 38·1 km. in 1933. Each passenger train carried on the average 64·9 persons, against 73·1 in the previous year. The unfavourable use of the accommodation provided was not much improved by the increased use of short train units and railcars, but against the figures just given must be set the fact that train-km. were 3·9 per cent. more although axle-km. were 1·1 per cent. and gross tonne-km. 2·9 per cent. less.

The goods traffic provides the one really encouraging feature in the picture. In 1933 the receipts were only 0·2 per cent. lower than in 1932, and rose 2·1 per cent. in 1934. The paying tonnage carried was 19·4 against 18·5 million tonnes, an increase of 5·0 per cent. Tonne-km. were 2,707 against 2,556 millions, an increase of 5·9 per cent. The average distance per consignment was 139·24 km. against 138·11 km. Average receipts per kilometre were 50,555 S. against 49,504 S. Still further reductions in rates caused the receipts per train-km. to fall from 18·41 S. to 18·47 S. Increased vegetable traffic, caused by an increase in the area under cultivation, and increased consignments of wood, gravel, and stone, a good deal being export, in connection with building and road construction, were among the chief causes of the improvement. Iron and ores also improved, but coal, coke, corn, meal and some foodstuffs declined. An analysis of the movements of goods vehicles shows that the number of those employed in inland traffic was 9·3 per cent. more than in 1933. In foreign traffic the number declined 0·6 per cent. Export and transit traffic were greater than before but import loads were less. Taken altogether there were 6·3 per cent. more loaded wagons run. Although imports did not fall as fast as they had been doing, they did so sufficiently to prevent the increase in export and transit traffic from putting the foreign goods traffic on the right side. When the traffic receipts are compared with those of 1929 the following results appear:—

	(Millions of Schilling)		Difference, per cent.
	1929	1934	
Passenger and parcels	218·9	138·8	−36·6
Goods	412·8	271·3	−34·3
Total	631·7	410·1	−35·1

In the face of this large decline the management was compelled to seek every possible way of improving the situation, and if receipts could not be increased the only resource was to cut down the expenses. How far this has been done is illustrated by the following table:—

Operating Expenses in Millions of Schilling

	1929	1933	1934	1934 to 1929 Difference per cent.
Wages and salaries ..	349·2	210·7	195·0	−44·2
Pensions	93·4	133·3	138·7	+48·5
Total	442·6	344·0	333·7	−24·6
National Insurance ..	14·9	14·9	11·3	−24·2
Fuel for locomotives ..	43·9	29·1	22·9	−47·8
Materials other than fuel	94·2	46·8	50·4	−46·5
General expenses	30·1	18·0	16·1	−46·5
Contribution to interest and depreciation charges	12·4	12·2	12·2	− 1·6
Total	638·1	465·0	446·6	−30·0

A net saving of 108,900,000 S. has thus been made on staff payments alone in 1934 as compared with 1929. This is due partly to reductions in staff, partly to reductions in rates of pay. The numbers employed have fallen 35·3 per cent. compared with 1929. There were then 14·9 persons per kilometre; now there are only 9·8, while the average remuneration paid was 4,162 S. in 1929 and is now 3,545 S.—14·8 per cent. lower. The reduction in staff was necessarily accompanied by heavier pension charges, as shown in the above table, there being some 20,000 more pensioners now than in 1929. The drop in the cost of fuel has been considerable; the coal used was 40 per cent. less than in 1929, but the gross tonnes-km. run by steam only 34·7 per cent. less, showing an appreciable saving. Better purchasing resulted in the price of coal falling also. The gross tonne-km. run by electricity have risen from 1·9 millions in 1929 to 2·4 millions in 1934. Great care has been exercised in the purchase of materials of all kinds and the costs of repairs and renewals have been supervised very strictly. This is illustrated by the fact that a reduction was made in 1934 as compared with 1933 of 18·4 million schilling in working expenses. Fuel consumed was again reduced in the twelve months, although the work done by steam was slightly heavier. The cost of electric power rose by 200,000 S. on account of increased load. Materials cost a little more in 1934, especially lubricants, the railcars requiring a particularly good grade. The general result has been to bring down the deficit on working.

The debt charges were 70·7 million schilling against 72·0 million in 1933, the reduction being made by apportioning a certain amount of constructional costs to be redeemed by payments from revenue account. The

losses on the road motor services and costs of the tourist offices are to be debited to that account also. The fall in the traffic had enabled the liabilities due to depreciation to be estimated at a lower figure in 1933 than it had been on the basis of the Herold report, *viz.*: 48,060,022 S. The same figure was taken for 1934 and to it were charged renewals 16,900,000 S., loan repayments 18,600,000 S., and 9,300,000 S., previously taken from the Treffer loan for renewals, leaving 3,300,000 S., which has been added to the 17,500,000 S. carried over from 1933. To this must be put 1,400,000 S. for depreciation of road motor equipment. The Government granted a credit to the railways out of the Treffer loan amounting to 37,600,000 S., and in 1934 electrification took 3,800,000 S., way and works 9,500,000 S. and rolling stock 300,000 S. To meet the total loss on the undertaking the Government finally budgeted a sum of 103,900,000 S., which was more than enough, the surplus being used to reduce debt charges to the State and in other ways. The difficulties of the railway system in Austria are thus still sufficiently disquieting, in spite of the improvement in goods traffic and the drastic reductions in expenses above referred to. Political circumstances have resulted in a great loss of tourist traffic on the Western frontier and it is much to be hoped that this obstacle will be removed in the near future.

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Railway Assessments

THE annual report of the proceedings of the Railway Assessment Authority for the year ended March 31, 1935, to which brief reference was made in our issue of August 23, deals very fully with the proceedings arising out of the Southern Railway valuation. It also gives in an appendix particulars up to that date relating to the preparation and contents of the various parts of the first railway valuation roll, which when finally settled will have retrospective effect to April, 1931. This roll consists of five parts, namely the valuations of each of the four amalgamated companies and of the Metropolitan Line of London Transport. There are three stages in the preparation of the roll: (1) the settlement of a draft of the roll (or part thereof relating to a particular railway company), after which representations by parties affected may be made to the authority during a period of not less than two months; (2) the completion of the roll (or part), after which appeals may be made to the Railway and Canal Commission (and eventually, under certain conditions, to the House of Lords); and (3) the revision of the roll (or part). Each of the five parts of the roll has to be completed and then revised before the local valuation lists can be amended with retrospective effect to April, 1931. In order to secure a proper apportionment of the cumulo (or net annual) value to each hereditament or part of the undertaking of a company, the undertaking is divided into four constituent undertakings: (*a*) the principal undertaking (*i.e.*, broadly speaking, the railway proper); (*b*) each canal undertaking; (*c*) each dock undertaking; and (*d*) each subsidiary undertaking. Further, the hereditaments of the principal undertaking are subdivided into (1) Class A, comprising all the hereditaments consisting of "land used only as a railway made under the powers of any Act of Parliament for public conveyance" (a phrase which has a special significance outside London, because there—but not in London—such land is subject to a lower incidence of rating in urban areas); and (2) Class B, comprising all other hereditaments not being "land used as a railway, &c." The block of net annual value allocated to Class A as a whole is further subdivided between the "traffic element" and the "non-traffic element." The reason for this further sub-division is that in hereditaments consisting of "land used only as a railway, &c.," there are parts (*e.g.*, portions of platforms and other areas), over which no traffic is conveyed and as to which therefore volume or value of traffics affords no criterion of relative value.

The draft of the Southern Railway part of the roll was settled by the authority on August 1, 1933. The cumulo or net annual value of the undertaking as a whole was first put at £2,250,000, but was subsequently amended to £2,180,000. Representations were heard from the railway company and from local authorities, and the valuation was reduced by the authority on April 27, 1934, to £2,180,000, its figure for the "completed" roll. This was made up of £2,069,869 for the railway (£1,688,037 Class A and £381,832 Class B), £110,025 for the docks and £106 for the canals. Appeals against this cumulo were made by the railway company and certain local authorities to the Railway & Canal Commission, which after 16 days' hearing, decided in February, 1935, that the directions contained in Section 4 (2) of the 1930 Act could only be achieved by a proper application of the "profits basis." In giving effect to their judgment the Commissioners applied a percentage of 15 per cent. to a tenant's capital of £27,610,697, which produced £4,141,603, and to this they added £189,266, being 10 per cent. of the receipts earned without the employment of tenant's rolling stock, giving a total of £4,330,869, which, when deducted from the net receipts of £5,408,000 left a figure of £1,077,131 as the net annual value of the undertaking as a whole. Appeals by the authority and various local authorities against this decision to the House of Lords are now pending.

Apart from the cumulo the Railway & Canal Commission has dealt with appeals relating to the rating of (1) "let out" properties, (2) offices said to be used for general direction and management, and (3) high-tension electric cables and electrical sub-stations on the Southern Railway. Under (1) concerning properties at Victoria passenger station and Beckenham junction goods station, which were taken as test cases, the Commissioners held, against both the Railway Assessment Authority and the local authorities that all the "let out" properties inside the gates or doors of the two stations in question were not capable of separate assessment in the hands of the tenants and that they therefore fell to be included in the railway hereditaments in the roll. As to (2) the Commissioners dismissed the railway company's appeal and upheld the contention of the authority that these offices were primarily occupied and used as offices for, or for purposes ancillary to, the general direction and management of the railway. With regard to (3) the Commissioners allowed the railway company's appeal, holding that these electric cables, &c., were "hereditaments consisting of land used only as a railway under the powers of any Act of Parliament." These decisions were given on April 15, 1935. It is not stated in the report whether there is to be any further appeal in respect of those three matters.

In consequence of the decision of the Railway & Canal Commission in the Southern Railway case the Assessment Authority on April 27, 1935, when completing the London & North Eastern Railway part of the roll, inserted "nil" as the cumulo of that undertaking in England and Wales, contrasting with the draft figure of £3,500,000. The draft cumulo figures for the London Midland & Scottish Railway (in England and Wales), the Great Western Railway, and the Metropolitan Line are respectively £5,000,000, £2,800,000, £2,800,000, and £336,000, but it has been agreed that these parts of the roll shall not be "completed" until after the decision of the House of Lords in the Southern Railway case has been given.

XUM

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Peak Period Problems

99, Clifton Road, S.E.25.
August 27

To the Editor of The Railway Gazette

Sir,—*A propos* your recent suggestions for relieving the August rush, might not the problem be at least partially solved by allowing a holiday to be taken in two parts—one before and one after the congested period—at a cost of one return fare for the two return journeys? With tickets printed for the purpose, it should not be difficult to indicate, by means of suitable punchings, the period remaining unexpired after completion of the first trip, out of a total availability of, say, thirty to thirty-four days.

Such a scheme should offer many attractions. Any lengthening of the holiday season would, in effect, be an increase of holiday accommodation (time × rooms), and virtually a creation of new wealth. Prices, especially in August, would be lowered, and the total number of holiday-goers increased. Furthermore, two trips at one ordinary return fare would bring the railways 50 per cent. more than one trip at single fare and a third; whilst passengers taking advantage of such a concession would recover the extra outlay on travel in the shape of cheaper lodging expenses.

It might be thought that this latter consideration would be in some measure offset by the increased demand for accommodation ensuing in early summer and the autumn. But closer reflection will reveal that such would not be the case. The extended season and consequent increase of earning power would be far more likely to bring about a general reduction in the scale of charges, even during the periods in question.

Yours faithfully,
K. H. JOHNSTON

L.M.S.R. Autumn Accelerations

16, Swinbourne Grove, Withington,
Manchester. August 24

To the Editor of The Railway Gazette

Sir,—The reports regarding an autumn speed-up on the L.M.S.R. lines encourage the belief that something really progressive is contemplated. The arrangements published for September 30 are satisfactory, and excite favourable if not enthusiastic commendation, but as your correspondent, Mr. Humphrey Baker, remarks, there is much that could be done by our "canny" railway companies to stir people's imagination and get them really railway-minded.

Certainly I have no wish to belittle what has been accomplished. The companies have undoubtedly girded themselves to the task, but the ordinary traveller can, without being in the least idealistic, see a host of possibilities that might be more liberally exploited as good business appeal. The poster campaign has done much, but it is hardly fair to have to turn from that thrilling picture "Scot passes Scot" and be faced by a couple of "Scots," both of them as black as soot. I remember when the drivers of the Caledonian Company used not only to keep their engines clean but even adorned them with beautiful figurative metal work around the centre of the smokebox. But drivers get little encouragement for that kind of thing now. Why try and rouse our enthusiasm and imagination with posters, only to blunt them again with the absence of paint and the toleration of dirt.

I always hate to criticise. I live in Manchester and have lived in London. From the former it takes an hour and a half to get to Blackpool—49 miles. From the latter it takes an hour to get to Brighton—50 miles. And the Brighton route was a harder one for steam trains than the Blackpool one. The L.M.S. talk of half an hour from Luton to St. Pancras. That is good, but a little of the same organisation is needed in Lancashire.

But to me Scotland is the finest field for improvement that I know. Twenty years ago I lived and travelled over it, but in the matter of improved services, stands Scotland where she did? Most decidedly yes. I think it is over 30 years since the companies there introduced the one-hour run from Glasgow to Edinburgh—approximately 45 miles—yet nothing appreciably better prevails today. Thirty years ago the Caledonian Company tackled the heavy road between Glasgow and Carlisle in two hours. Nothing better prevails today. Twenty-five years ago the same company had a morning train scheduled to run the 90 miles from Perth to Aberdeen in 97 minutes.

Let us hope that there the companies will strike out rapidly for more progress; more and brighter paint on engines rather than on posters; a few more carriage cleaners at terminal stations; the choosing of colours that will look pleasing, and not so much with an eye on the main chance of being so drab that they can never show the dirt. And while the companies are about it there is much room for improvement in station restaurants and buffets. The services are poor and the prices are high. Better hand a few of them over to Lyons.

Above all, more power to the speed and punctuality drive, for who can read of the wonderful performances of *The Princess Royal* without feeling that in Scotland, particularly, the time is ripe for very great improvements. With schedules of 180 minutes between Glasgow and Aberdeen; 110 minutes between Glasgow and Carlisle; 150 minutes between Carlisle and Crewe, and 150 minutes between Crewe and London, the L.M.S. will indeed have something in its timetables fit to publish in large block type and underline.

Yours faithfully,
B. NEWTON BROOKE

Fissured Rails in the U.S.A.

Manhattan Bridge Plaza
Brooklyn, N.Y., August 15

To the Editor of The Railway Gazette

Sir,—An editorial note entitled "Rail Fissures in U.S.A." which appeared in your issue of June 14 has just come to my attention. I note you say therein that "It is an encouraging sign of the efficiency of the detection methods now being applied, however, that in 1933, for the first time on record, the number of fissures detected in time, totalling 4,661, exceeded by 198 the number of rails, totalling 4,463 breaking in service as a result of transverse fissuring which had not been discovered before failure." You will be interested to know that in 1933 the fleet of Sperry detector cars testing in the United States and Canada found 8,252 transverse fissured rails. This is nearly twice the number of service failures (4,463) reported for that year. Therefore, I should like to take the liberty of suggesting that you amplify the facts and figures presented in the article referred to above.

The explanation of the discrepancy in the sets of figures is as follows: The statistics gathered by the American Railway Engineering Association are necessarily incomplete, for the reason that it is against the policy of a number of railroads to report rail data. As a consequence, only some 30 Class I railroads, on the average, report detected fissures, and only some 46, on the average, report service failures. A true picture of the situation would show that there were approximately 9,000 fissures detected in 1933 and about 5,000 service failures.

Yours faithfully,
ANDREW STEWART,
Publicity Director,
Sperry Products, Inc

PUBLICATIONS RECEIVED

G.W.R. Magazine Centenary Number.—As was to be expected, the *Great Western Railway Magazine* has provided in its September issue an extraordinarily fine collection of historical articles, and that without increasing the usual price of 1d. (or 2d. on art paper), although it contains 102 pages. Some of the illustrations are reproduced from rare originals, and, of course, the conventional subjects are adequately covered. Perhaps the most fascinating pictures to the historian are those of the original parchment sheets of the G.W.R. Act of Incorporation, "Anno 5° et 6° Gulielmi IV." This issue of the *G.W.R. Magazine* is, we venture to suggest, complementary to our own special number issued last week, and, with that of *The Times* noticed below, a valued addition to the historical literature issued in connection with a notable centenary.

"The Times" Special G.W.R. Centenary Number.—With its issue of Saturday last *The Times* celebrated the one hundredth birthday of the Great Western Railway Company by issuing a special number which makes a worthy addition to the series of similar productions, published to mark outstanding events, for which *The Times* has long enjoyed a justly distinguished reputation. An outline of the history of the railway—a many-sided narrative of achievement and disappointment, delay and triumph—comes appropriately from the pen of Mr. E. T. MacDermot, the author of the most recent standard work on G.W.R. history; a study of the life, work, and character of Brunel is by Mr. Rollo Appleyard; and Mr. A. C. W. Lowe writes about steam locomotives, and the men who designed and built them. There is also a description of some of the notable runs and historic journeys made by Great Western Railway trains, including Queen Victoria's first journey. Swindon works form the subject of a special article, as also does Paddington station, while an account of ancient and modern railway regulations provides diverting comparisons, particularly as the regulations for the staff in 1838 were contained in 12 pages of manuscript! Generous and well-produced illustrations complete a work which is doubtless destined to be preserved in the collections of all railway historians.

La Stabilité de Route des Locomotives. By Y. ROCARD. Paris: Hermann et Cie., 6, Rue de la Sorbonne, 6. 10 in. × 6½ in. 65 pp. Price fr. 15.—This publication (in French) treats of the progress of a locomotive along a straight track and the conditions under which it will abandon straight rolling and begin to oscillate from side to side with a nosing motion. The treatment is entirely mathematical, and readers who have not the kind of mathematical brain that considers a complicated equation to be a complete answer to any problem are therefore unlikely to appreciate this work at its proper value. The basis of the investigation is an idea which the author terms *glissement reduit*, and which seems to have been derived from the motion of a pneumatic tyre and its possible movement in a slanting direction without slipping, in the ordinary acceptance of the word. The result is very similar to what is known in this country as "creep," but it is brought into a mathematical form by assuming a thin film between the wheel and the rail with a certain coefficient of viscosity, and to get reasonable results the thickness of this film is taken to be of the order of $\frac{1}{3000}$ in. Reference is made to some experiments on a wheel rolling in contact with a cylinder, and these are said to support the theory, but no actual figures are given, so they cannot be checked. A 4-8-0 locomotive is taken as an example, but in extremely general terms, with round figures for the weight, &c., and no mention is made of the effect of the reciprocating masses. As an exercise in mathematics the book is admirable, and the results obtained are interesting in a general way. They are, however, hardly reliable for practical application as so many assumptions and approximations have to be made, such as replacing the shock of a wheel flange against the rail by a force proportional to the lateral displacement of the axle. It is, of course, impossible to represent in mathematical form the irregular shocks that actually occur, but, by assuming the lateral displacement to be a sine curve with suitable harmonics superposed, various approximations can be obtained.

Laboratory Tests of Three-Span Reinforced Concrete Arch Ribs on Slender Piers. Bulletin No. 269 of the University of Illinois Engineering Experiment Station. University of Illinois, Urbana. 9 in. × 6 in. 122 pp. Photographic illustrations and many line diagrams. Price $1.—After giving a description of the materials and instruments used, this report describes a series of tests on a single reinforced concrete arch, having a span of 27 ft. and a rise of 6 ft. 9 in. The end reactions and moments were measured not only for various loadings of the arch, but also for known horizontal and vertical movements and vertical rotations of one abutment. The results agreed well with those calculated by the elastic theory. Having thus verified the accuracy of the instruments, similar tests were made with a series of three arches, which had two slender piers at the junctions of the spans. Instruments were placed at the abutments and on the piers in such a way that the latter could be investigated for various heights. Once more, variations of loading and end conditions showed that calculated figures were very near those actually measured. The results of the experiments are very encouraging from a theoretical point of view, but in practice the end conditions and the pier deflections during and after construction cannot be accurately known.

Phosphor Bronzes.—Damaxine phosphor bronzes, manufactured by the Manganese Bronze & Brass Co. Ltd., Handford Works, Ipswich, are supplied in chill-cast solid and cored rods and in ingots in grades suitable for all industrial purposes. The booklet under review summarises the properties of the various qualities and illustrates applications of Damaxine phosphor bronze to the bearings, bushes, and other components of many types of machinery. The material is equally suitable for carrying light loads at high speeds, as for such heavy duties as stone-crusher bearings. The main portion of the booklet deals with the selection of grades of the metal appropriate for various duties, but there is a concluding section on the machining of Damaxine. Weights per foot of varying diameters are shown.

Electric Fans.—Fans for wall or roof mounting and specially designed for the ventilation of railway coaches and compartments, are described in a new catalogue from the General Electric Co. Ltd., Magnet House, Kingsway, W.C.2. Particular attention has been paid to constructional strength and easy replacement of the driving motor by the train staff in case of failure. The mounting is designed to enable the fan to be adjusted to blow in any direction without having to slacken fixing screws, and ensures that it stays in the required position. Neat-pattern speed regulators with "off," "slow," "half," and "full" positions are supplied for use with these units. Other ventilating equipment listed includes table, bracket, and ceiling fans for general purposes, ship fans, and exhaust fans. All types are shown diagrammatically, with a key to spare parts. Special silence chambers have been erected at the G.E.C. works for testing fans for silent running, and as well as elimination of mechanical noise, magnic hum has been much reduced.

Liquid Fuel Burning.—Babcock & Wilcox Limited, Babcock House, Farringdon Street, E.C.4, has published a copiously illustrated handbook on the uses of oil fuel and systems for its application to steam generating plant. The book is in four sections, the first dealing with types of burners, including those for the combined consumption of gas and oil; section B illustrates oil fired, and oil and coal-fired boilers, with notes on the choice of burners for those of the cylindrical pattern; and technical data relating to tests with industrial and marine boilers fired by Babcock & Wilcox oil fuel systems are set out in section C. The last section of the text is devoted to practical advice and precautions regarding the operation of oil fuel burners. A concluding pictorial chapter illustrates Babcock & Wilcox installations ashore and afloat. Among the latter are shown the G.W.R. ss. *St. Andrew* and the Southern Railway ss. *Canterbury*, both of which have the firm's boilers and oil-firing equipment.

XUM

THE SCRAP HEAP

Some Views on the G.W.R. Centenary

It was exactly a century yesterday since the Bill for the construction of the Great Western Railway received the Royal Assent. Only the elderly can now recall when it still travelled on Brunel's broad gauge—a design peculiarly harmonious with the comfort and courtesy which have managed to survive its disappearance. The Great Western has kept its identity as well as any enterprise with which it can be compared, and as London's greatest outlet of recreation, is peculiarly invested with happy associations. —*From "The Observer."*

The Great Western Railway, which celebrates its centenary today, has every reason to be proud of its hundred years of public service. It links the ages of the stage-coach and the motor-coach, and though the one was long ago eliminated, the other remains as a severe competitor of the railways. The British railways as a whole are meeting the competition of the petrol era with vigour and discrimination. In recent years there has been a general increase in speed with a wide extension of excursions and other facilities of which the public have been quick to take advantage. There will be no lack of passengers while British lines retain their unrivalled reputation for safety, speed, and comfort. — *From "The Daily Mail."*

One hundred years ago today, and almost exactly ten years after the opening of the first public railway in the world to be worked by steam, which was the railway between Stockton and Darlington, the Royal Assent was given to a Bill for the making of the Great Western Railway. The very lively centenarian is doubtless keeping the anniversary on its own account. The contribution of this journal to the celebration is the Great Western Centenary Number presented with *The Times* this morning. In that Number an effort has been made to exhibit its subject in every one of the many aspects in which, first, this great railway itself and, next, railways in general occupy the thoughts and emotions of men. From the days when the railway was a new and mysterious birth—to some minds a child of hell, to others an angel of light—down to the present moment, when the long periods of success and of failure, of dominance and of subservience, have brought the English railways to a moment in which some see the twilight of their decline and others the dawn of a new day, the story of the Great Western Railway is followed in engineering, mechanics, geographical growth, commerce, war, social usage, and a score of other fields. Of all those fields one must needs be of supreme national interest at the present time. The railways played a capital part in the industrial success of Great Britain. How to maintain and how to improve so much as is left of that success is now a problem that keeps statesmen and others awake of nights. Meanwhile the supremacy of one of the strongest elements in it, the railways, has given place to a struggle against other forms of transport.—*From "The Times."*

The centenary birthday of the Great Western Railway calls for something more than perfunctory congratulation. It may be said without disrespect to any other railway system in Britain that the Great Western is unique in having impressed a sense of its character —one might almost say its personality —on all who know it well. There are persons who have a veneration for railways as such, among them engineers and schoolboys and the head of a certain Oxford College who is believed to know his Bradshaw off by heart—and another don, a philosopher, who used to spend much of his vacation leisure in watching the departure and arrival of trains at London termini. But that is a general enthusiasm. Far more definite, far more personal, is that regard which by some peculiar magic of places, travel, history, and memory is evoked, not by railways, but by the Great Western Railway in particular. Its essential character has refused to be diminished or altered by all the changes that have come over railway administration in recent years. —*From "The Spectator."*

That the Great Western was not the pioneer line in this country by no means detracts from the romantic character of its achievements during the course of the past hundred years. But it can claim to be the first among its fellows to cross the century line in the sense that it retains the title under which it began its career. . . . The story of Great Western development during the past century brings out in clear indication the march of events in the wider sphere of national history. The Crimean war, the Indian Mutiny, financial crises and high bank rates, all had their effect on the rate of progress during the construction period. At so high a pitch was expectation placed that shareholders' committees were quickly forthcoming when it was felt that affairs were not proceeding as they should do. Of the many crises which threatened the company's fortunes, the best remembered is that which culminated in an appeal to the Government for help. The banking panic of 1866 placed many railway and other enterprises in a difficult position. The Great Western's loan burden could not be relieved in the ordinary way by the issue of new capital owing to the state of the market, and revenue had to be used to pay off temporary advances. A treasured possession of the company is Mr. Disraeli's letter as Chancellor of the Exchequer, refusing the request for the guarantee of an advance of £1,000,000—which the Bank of England had already declined to consider. The faith and forbearance of the company's creditors enabled the dangerous period to be passed without external aid.—*From "The Financial Times."*

By a curious coincidence, the line of railway between Botzen and Innspruck, over the Brenner Alps, was opened for traffic almost simultaneously with the line over Mont Cenis, though it had been completed some weeks previously, and engines had passed over it. By means of the line a vast portion of the trade hitherto absorbed by Trieste —the Liverpool of Austria—will be transferred to Venice.—*From "The Railway News" of September 7, 1867.*

* * *

Speaking in the House of Commons in November, 1847, the Chancellor of the Exchequer reviewed the rise and progress of railways. In 1826, he said, Parliament had sanctioned works to the amount of £1,500,000; from the year 1826 to 1835 the amount sanctioned was £19,000,000; from 1836 to 1837 it was upwards of £36,000,000; but, in consequence of the great distress that existed, comparatively little progress was made with railways till 1844 and 1845, when no less a sum than £74,000,000 was sanctioned. The House and the public were aware of the mania that existed in the autumn of the latter year for railway speculations; and some estimate might be formed of it when he stated that 800 plans were deposited with the railway department of the Board of Trade; and in the year 1846 the amount actually sanctioned by Parliament was no less than £132,000,000; making a total of £286,000,000; two-thirds of which had been sold within the three previous years. In 1847 an additional sum of £38,000,000 was sanctioned by Parliament. Of the sums already voted by shareholders, there remained to be expended £145,000,000, in addition to the £38,000,000 sanctioned in 1847. The actual expenditure on railway works, beginning from the year 1840, was as follows:—

	£
1841	1,407,000
1842	2,980,000
1843	4,435,000
1844	6,100,000
1845 (first half)	*3,500,000*
1845 (second half)	*10,600,000*
1845 (Total)	14,100,000
1846 (first half)	*9,800,000*
1846 (second half)	*26,675,000*
1846 (Total)	36,475,000
1847 (first half)	25,700,000

According to estimates that had been made by the Board of Trade, the amount required up to the close of the present year (1847), including the purchase of land, would be little short of £65,000,000.

OVERSEAS RAILWAY AFFAIRS

(*From our special correspondents*)

EGYPT

State Railway Earnings for 1934-35

These earnings, exclusive of £E.28,780 from road and river services, amounted to £E.5,090,981, as against £E.5,011,923, exclusive of £E.34,766 from road and river services for the financial year 1933-1934—an increase of £E.79,058. This is an increase of 1·57 per cent. on the earnings of the previous year and works out at 232 m/ms. per train-km. as against 246 m/ms. per train-km. in 1933-1934, and £E.1·441 m/ms. per km. open for traffic as against £E.1·472 m/ms. per km. open for traffic in 1933-1934. It may be noted that the length of line open for traffic in 1934-1935 was 3,532 km. as against 3,404 km. in 1933-1934.

E.S.R. Road Services

On July 7 the Eastern Commercial Company, in which the State Railways hold 51 per cent. of the shares, took over the management and operation of all E.S.R. buses. In addition to operating many of the routes previously worked by the E.S.R., the following new routes are now being worked by this company from Tanta to Kafr El-Zaiyat (4); El-Shohada (4); Disûq (4); Gaafaria (2); Zifta (7); Birket El-Sab' (13); Minûf (1); Bassiuon (3); Talkha via Mehalla (8); the figures in brackets being the numbers of buses running on each route. Altogether there are 46 buses.

Extended Use of Long Rails

An experiment is being made in the laying of welded rails for a length of one km. in the section between Madabegh and Maadi, a suburban line in the Cairo area. Rail lengths of 144 m. are first welded and laid, and these lengths are later welded together: the welded joints are staggered. The kilometre under trial has steel sleepers, as it is considered that steel sleepers hold the road more firmly on its bed than wooden sleepers. It will be recalled that a trial with rails of 36-m. length was recently made on a goods line between Moasla and Tura, which has proved satisfactory.

Collection and Delivery of Parcels at Cairo and Alexandria

On August 1, the State Railways instituted a system for the collection and delivery of all parcels traffic by express and passenger trains at Cairo and Alexandria. Parcels from all E.S.R. stations are now delivered in Cairo and Alexandria within an 8-km. radius of the main stations, when the address of the consignee is given by the senders. Personal baggage is collected and delivered from and to passengers' private addresses in Cairo and Alexandria on request, and also from or to steamers in the case of passengers arriving or departing by steamer at Alexandria. Cartage charges at the rate of 2 m/ms. (1s. 2d.) for 10 kg. for each operation, collection or delivery, at each end, with a minimum charge of 10 m/ms. (2s. 0½d.) a package for each service is made. It is understood that this system, if found satisfactory, will be extended to other large towns in Egypt.

ARGENTINA

Modifications to Transport Co-ordination Bill

Important changes have been made in the scope and provisions of the Transport Co-ordination Bill by the committee of the Chamber of Deputies [as outlined in our news columns on page 238 in THE RAILWAY GAZETTE of August 9.—ED. *R.G.*]. The Co-ordinating Committee, as now proposed, will be composed of a president (to be appointed by the Government); the Chairman of the National Roads Board; the General Manager of the State Railways; the Director of Navigation and Ports; the Director-General of Railways, and representatives of the private railways, the coastwise shipping companies, and the road transport concerns. The committee will be authorised to issue permits to concerns engaged in transportation within the national territories, between the latter and the provinces, between different provinces, or between the provinces and the Federal Capital, with a maximum duration of 10 years. Such permits cannot be renewed or transferred except by special authorisation. Transportation of lorry owners' own goods is excluded from the scheme; also those individual lorry owners who work for third parties and drive their own vehicles. In no case may the regulations issued by the provinces and municipalities be allowed to interfere with inter-provincial traffic, and road transport concerns cannot be made to comply with more than one set of rules, except the traffic regulations issued by the municipalities within their jurisdiction.

New Services Must be Essential

One of the functions of the committee will be to endeavour to co-ordinate the land, water and air transport services in such a manner as may be best suited to the public interests and the national economy, and when issuing permits, the committee is to take into consideration the necessity or otherwise of the proposed new service, and whether or not the existing transport facilities are sufficient for the needs of the zone in question. Companies to which permits are issued will be exempt from all taxes except those imposed for the maintenance of the roads.

Proposed Co-ordination of B.A. Street Transport Services: Tramway Employees' Petition

Following the public demonstration of railway employees in support of the National Transport Co-ordination Bill [referred to in these columns in the issue of August 9.—ED. *R.G.*] a petition signed by several thousand employees of the Anglo-Argentine, Lacroze, Southern and Port Tramways, the new Spanish (C.H.A.D.O.P.Y.F.) subway, and various omnibus lines, has been presented to the President of the Chamber of Deputies, requesting the prompt passing of the Bill for the co-ordination of the City transport services, which has already passed through the committee stage (*vide* THE RAILWAY GAZETTE of March 3, 1935). The deputation which presented the petition was informed that the Bill had been included among the subjects on the agenda to be dealt with by the Chamber during the present session. A noteworthy feature about this petition is the fact that it was signed by a large number of omnibus employees. A good illustration of the vicious circle which has been created by the supine attitude of the Buenos Aires Municipality towards the street transport problem, is the fact that the omnibus companies have been thus forced to make common cause with the tramways against the " micro-buses " (" colectivos "), which are daily increasing in number, and now compete as severely with the omnibuses as the latter do with the tramways, with the result that several omnibus companies have been forced out of business, and others have had to curtail their services.

Railway Accident Law not Applicable to Decauville Lines

In an action brought recently in the Federal Court against the B.A.G.S.R. by a plaintiff who claimed damages to the amount of $20,000 paper in respect of the death of his son, who was killed by a tank engine and two wagons belonging to the railway, the judge decided in favour of the company, on the grounds that the law relating to the responsibility for such accidents did not apply to Decauville lines. The accident, which occurred at a level crossing in the vicinity of Balcarce in the Province of Buenos Aires, was due to a motor lorry driven by the deceased colliding with the railway convoy. The plaintiff's case was that the company was guilty of negligence under two heads: (*a*) In employing a tank engine for haulage purposes instead of an ordinary locomotive which had better means of visibility; and (*b*) in not having installed barriers at the crossing in question. For the company it was argued that the lorry had rammed the train, instead of vice-versa; that the company had no obligation to erect

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barriers at the crossing, and furthermore, that the ordinary railway laws did not apply to a Decauville line.

In pronouncing his decision, the judge upheld the company's case on the grounds that Decauville lines were exempt from the provisions of the railway laws relating to accidents, as established by Government decree dated January 1, 1920, and pointed out that the Director-General of Railways had declared that the line in question was outside the national jurisdiction. Moreover, by the terms of the concession for the line, granted to the railway company by the Municipality of Balcarce, the concessionaires were not obliged to adopt special measures for public security by placing barriers at this point. The judge also referred to the conflicting evidence of the witnesses as to whether the blame for the accident rested with the road vehicle or the train, but remarked that the photographs taken after the occurrence suggested that it was the lorry which had rammed the train. On all the grounds, therefore, he found in favour of the railway company.

BRAZIL

São Paulo-Paraná Railway

At the annual meeting of the above company, held on June 30, the following financial results for the year 1934, compared with those of the previous 12 months, were announced:—

	1933	1934	
Gross receipts ...	1,705	2,640	contos.
Expenditure ...	1,701	2,632	,,
Net receipts ...	4	8	,,

So that, although there was a satisfactory increase of 935 contos, or 54·8 per cent. in gross takings, expenses were up proportionately, and the net figure showed but little improvement on the previous year's. Work on the Jatahy-Londrina extension, including the reinforced concrete bridge over the River Tibagy, had been completed shortly before the meeting was held, and this stretch was officially opened a few days later.

Estrada de Ferro de Goyaz

The estimate, totalling 7,320 contos, for the cost of extending this railway from Leopoldo Bulhões to Annapolis and beyond, and for the acquisition of additional locomotives and stock, has been approved by the Accounts Tribunal.

Paulista Railway Company

In accordance with the terms of Decree No. 7,323 of July 5, the São Paulo State Government is granting powers to this company through a contract to be signed within 90 days of the promulgation of said decree, to construct and subsequently operate an extension of the Estrada de Ferro de Monte Alto, to start from Vista Alegre and terminate in Pirangy, obeying the conditions laid down in Law No. 30 of June 13, 1892, and provided that no objection be raised by the military authorities. To carry out the above-mentioned work, the Paulista Railway is empowered to withdraw the necessary sums from the special Renewal Fund, the product—since it was first authorised in 1927—of a 10 per cent. levy on all rates and fares. The Estrada de Ferro de Monte Alto, which connects with the Paulista main line at Ibitirama, was transferred to this company by a State Decree issued in November last.

São Paulo-Rio Grande Railway

According to the report of Dr. Alexandre Gutierrez, the Superintendent of this system since the beginning of 1933, the year 1934 was a highly successful one. By means of judicious retrenchment, and in spite of unavoidable expenditure on permanent way and rolling stock repairs, net receipts amounted to 1,331 contos, the largest recorded since the system was taken over by the Federal Government at the end of 1930. Of this sum, 670 contos were ear-marked for the acquisition of rolling stock and for urgent constructional undertakings.

The total extent of the system, at the end of 1934, was 2,006·5 km., subdivided as follows:—

	km.
Itararé-Rio Uruguay line (trunk line)	882·5
Paraná Railway (Paranaguá-Curityba-Ponta Grossa, and Serrinha line) ...	389
São Francisco line	468
Paranapanema branch	190·5
Barra Bonita-Rio do Peixe branch ...	76·5
Total	2,006·5

CHILE

Chilean Transandine Railway

According to advices from Santiago de Chile, the Government has sent a message to Congress soliciting authority to allot the sum of $1,600,000 pesos (approx. £16,733) to the Chilean Transandine Railway for the payment of salaries and wages and to meet the operating expenses not covered by the receipts.

Another Proposed International Railway

Apparently undeterred by the fact that the country already has on its hands two half-finished international railways, via Lonquimay and Antofagasta-Socompa respectively, both of very problematical economic value, while the Chilean Transandine Railway (transferred last year to the State Railways) is being operated at a loss, proposals have been put forward by the Chilean Government for the construction of yet another international line through the Andes, to connect the port of Iquique with Oruro, the mining centre in Bolivia. The distance between these two points is about 190 miles, the greater part of which lies through extremely difficult country from the constructional point of view. It is stated that the Government has ordered a preliminary survey of the route to be made, to determine the probable volume of traffic from Bolivia.

INDIA

Compensation Claim by Branch Line

The recent visit to Calcutta of Sir Guthrie Russell and Mr. P. R. Rau was the occasion for a discussion of various railway matters between them and the committee of the Bengal National Chamber of Commerce. Among the topics discussed was the claim of the Bengal Provincial Railway Company—a branch line from Tarkessur on the East Indian Railway, to Tribeni—for compensation on account of loss sustained by reason of the construction of the Howrah-Burdwan chord line of the E.I.R. In 1917 an agreement was reached between the E.I. and B.P. Railways, whereby the former was to pay the latter an annual sum of Rs. 11,000. The committee pointed out that the B.P.R. accepted this settlement under protest, and when its revenues further declined it approached the Railway Board in 1930 for a reconsideration of the whole case. It was suggested that the E.I. Railway was prepared to re-examine the position, but that the Financial Commissioner rejected the application on grounds of estoppel. The committee emphasised that the B.P.R. was built without any State assistance. There was no other form of transport in the area traversed by the railway, which would have to be closed if suitable compensation from the E.I.R. or assistance from the State was not forthcoming. In that event some embarassment might arise to the Government by reason of the guaranteed interest payable by the Secretary of State on the Dasghara-Jamalpurganj Railway worked and owned by the B.P. Railway Company. The Chief Commissioner and the Financial Commissioner of Railways promised reconsideration.

Mileage Coupon Tickets

The committee also referred to the rejection by the East Indian Railway authorities of the proposal for the reintroduction of mileage coupon tickets for commercial travellers. The agents of the railways serving Calcutta invited suggestions for checking the misuse and fraudulent use of such coupons, but the proposals supported by the various chambers of commerce in Calcutta were not accepted by the Agent of the East Indian Railway. Sir Guthrie Russell and Mr. Rau undertook to look into the matter. The question of the reintroduction of mileage coupon tickets was also dealt with by Sir Zafrulla Khan, Member for Railways and Commerce, in his reply to a recent address from the Mysore Chamber of Commerce. The Honourable Member stated that the mileage coupon privilege had been greatly abused, particularly on the B.B. & C.I. Railway, where in a single year 121 cases of fraud were detected. He could not promise that the system would be revised unless the matter of checking frauds could be satisfactorily tackled.

RAILWAY MAINTENANCE PROBLEMS, IX.—MISHAPS ATTRIBUTABLE TO THE PERMANENT WAY

By Lt.-Col. H. A. HULL, M.Inst.C.E., District Engineer, Northampton, L.N.W.R. and L.M.S.R., 1918-33

Notwithstanding all the knowledge now available in print, some of the most essential and elementary facts are often ignored. There are always pioneers at work, on whose heels follow those with ingenious minds to record their results as formulæ for the future guidance of the unimaginative or timid.

WHEN it was decided a good many years ago to reduce the height of the top ballast on permanent way from rail level to slightly below the top of the sleeper, the reason had nothing to do with the proverbial safety of railway travel. It was to give the wooden sleeper a breathing surface, to facilitate inspection of the fastenings, and also to save ballast. Nevertheless, it probably may have contributed something to safe running, for those whose business takes them on to the permanent way cannot fail to notice the materials and merchandise that from time to time drop off passing trains and lie on the ballast. Such small items as bolts, nuts, and pieces of metal, are sometimes found and but for the fact that the top of the rail stands about 7 in. above the sleepers and ballast instead of as formerly a matter of an inch or so above the latter, such small objects might be hit by the wheels of passing vehicles and so form a potential danger. The guard irons in front of locomotives would always clear any substantial obstacle from the head of the rail, but with ballast almost up to its top there was nothing to remove obstacles from the flange way.

On the rare occasions when a mishap occurs it is almost impossible to reassemble from the debris parts of locomotives and vehicles which might be suspected to have caused the accident, and a part which may have dropped on the ground beforehand can easily escape detection or separate notice. On the other hand parts from a locomotive or vehicle that might have provided useful evidence in the enquiry are sometimes missing. An example occurred on the writer's division when a double-headed express train on the up line was passing over the Hademore watertroughs. The first engine, being lighter than the second, when the water scoop was lowered into the trough undoubtedly received a check to its motion and running parts, with the result that a defective side rod pin gave way allowing the bush, which holds the rod in position, to fly off. Despite subsequent intensive search the missing bush was never found, the inference being that it had been flung far into a neighbouring field and buried itself in the ground. It is therefore not to be wondered that sometimes when the cause of a mishap cannot be ascertained the permanent way is apt to be made the scapegoat.

Some years ago a locomotive hauling a fast train was partially derailed at a junction, although fortunately without any serious consequences beyond damage to the permanent way. The finding of the subsequent enquiry, after discussing the subject of hammer blow and other scientific data, made the suggestion that the gap in the crossing, together with the particular motion of the driving wheels which had become derailed, was a contributory cause. In view of the fact that there are innumerable crossings over which thousands of train movements take place every day with complete safety, it would seem that there must have been something more substantial to account for the derailment. It was agreed that one of the brake blocks on the derailed driving wheels had been cracked before the wheels reached the crossing, the severed parts having been afterwards found with the exception of one piece which could not be accounted for. According to the report it would not have been possible for the missing piece, which was several inches cube, to have fallen on the rail immediately in front of the wheel, as there was insufficient room for it to have dropped down between the sand pipe and the wheel tyre. The author, having been invited to comment upon the report, carefully examined the corresponding brake block on a similar locomotive and came to the conclusion that it would have been possible for the piece of metal to drop on to the rail immediately in front of the wheel. It is therefore probable that the piece fell just as the flange was between the approach wing and rail of the crossing and acted as a ramp to lift the flange and cause the wheel to mount the rail, the piece itself being thrown by the blow right off the railway's property.

It is difficult to avoid the conclusion on reading reports on certain railway accidents that they have been wrongly attributed to defects in the permanent way, defects which in themselves would have been insufficient to cause derailment had the derailed vehicle been in good running order. The permanent way has to be laid and maintained under such atmospheric and geological conditions that even with the greatest possible care and attention it is liable to irregularities which no one can quite foresee and to which there is nothing comparable in the design and maintenance of a locomotive or vehicle.

That it takes a very bad piece of road by itself to derail a moving vehicle was demonstrated to the writer by observing the behaviour of a light 4-wheeled contractor's locomotive, which frequently attained speeds approaching 60 m.p.h. on an overland route during the making of a new line, where the ballast consisted merely of the turf which was being reserved for the eventual soiling of the slopes. The rails, laid to the 4 ft. 8½ in. gauge, were flat bottomed, of unequal section and lengths, and were dog-spiked to sleepers of varying shapes and sizes. Nevertheless, so well sprung was the little engine that it never left the road on these journeys. The importance of the correct springing and alignment of the wheels of vehicles cannot be overestimated, for without sufficient flexibility there is a risk of their not carrying their full weight and keeping in firm contact with the rail when it varies in level, as it must in order that cant shall be provided on a curve, and rail joints and such irregularities as have just been mentioned occur. Sinuosity of the framework of a vehicle can sometimes contribute to this end. The old type of timber framed wagon with its short wheelbase can be seen any day swinging its way in the company of much more rigidly built stock in fast goods trains, and yet it is more likely to keep the road under adverse conditions than the more modern type because of its flexibility. The case of the more rigid type of construction is illustrated by the following example. A box van belonging to another railway was derailed in the down sidings at Rugby, Trent Valley, on a sharp curve where there was no superelevation, superelevation not being provided in sidings. The permanent way was blamed, for the vehicle was reported to be in good order, yet other vehicles were continually using this siding without becoming derailed. A second and then a third derailment

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occurred at the same spot and the writer then discovered that on the second and third occasions the vehicle was the same and of the same type as that which had been derailed the first time. It was a 4-wheeled box van of recent construction built up on channel iron framing of rigid construction and it appeared to be in good condition. Upon taking careful measurements, however, it was found that there was a wind in the frame and that one of the wheels was actually carrying no weight, a space of nearly ½ in. existing between the tyre and the rail. The risks of derailment of a vehicle in such a condition—and the writer has come across other similar cases—are illustrated in Figs. 1 to 4. On a perfectly straight line with the

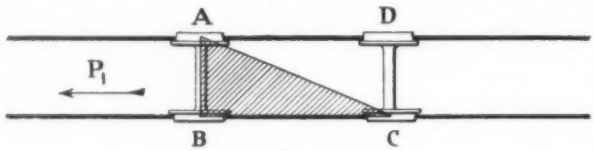

Fig. 1

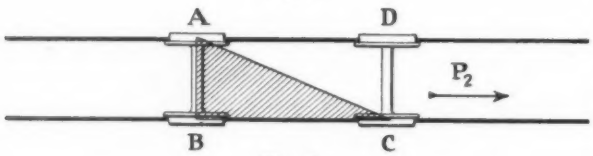

Fig. 2

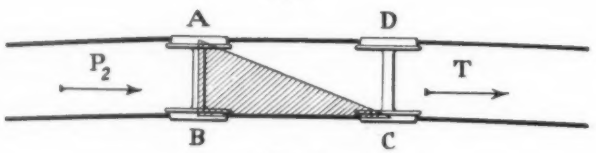

Fig. 3

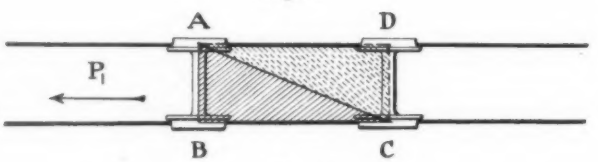

Fig. 4

pull in the direction indicated by P_1 (Fig. 1) even although only the three wheels A, B, and C are down on the rails, there is no likelihood of derailment, nor would there be even on a curve. If the pull is as shown in Fig. 2, should the wheel D not be seriously light, there is still little risk on moderately curved lines. If, however, a vehicle is pushed round a sharp curve, such as may occur in sidings and the light wheel D is leading (Fig. 3), there is always the tendency that the tangential force T may cause the wheel D to mount the rail.

In Fig. 4 is illustrated a similarly unbalanced 4-wheeled vehicle carrying a load, the centre of gravity of which is assumed to be near the centre of the frame and the pull being the direction P_1. At speed, oscillation will be set up and the triangle of bearing would alternate between ABC shown by full lines, and ADC by dotted lines. If any undue deflection or faulty alignment of the track is encountered at the instant when wheel B is not carrying its weight, there is the possibility of its mounting the rail.

Vehicles with three or more wheels aside do not altogether eliminate this risk if the end wheels are not all bearing equally on the rails and the centre wheels are carrying an excessive weight and so acting as a pivot. There are, of course, many other combinations of circumstances, but the above illustrations are intended to show the principles and importance of the matter.

Nearly all travelling cranes that are operated on the permanent way are provided with rail clips, one at each corner of the frame, ostensibly to prevent overturning when the jib is in action at right angles to the track. A crane so working on the writer's district once overturned and the permanent way was blamed. The fact was that the mishap occurred on a siding where the fastenings were not so secure as they would have been on a main line, but were amply sufficient for ordinary traffic. It is not reasonable to expect permanent way to have to withstand the overturning moments of cranes in addition to performing its legitimate duties. Extension pieces under which packing can be placed upon the ballast if the weight to be lifted is liable to overturn the crane are legitimate precautions, but the use of clips on the rails should not be permitted.

A clean record of no distortion of any running roads in hot weather is a sufficient justification of the practice of annually oiling the fishplates and their bolts. The oiling should be carried out in the spring before the hot weather occurs. It also provides the opportunity of thoroughly examining the ends of the rails themselves, so permitting of the detection of cracks through bolt holes, which occasionally occur.

One final warning of what might seem almost too obvious to mention may be made before concluding this series of articles. When an out-of-gauge load, which the Engineer's Department is frequently called upon to sanction for clearance, is carried, it is important that in the course of its journey it should not be reversed when shunting round a triangle, the load thus being transferred from one side to the other in the process. The writer actually knew of a mishap which occurred through this precaution not having been taken.

(*This article concludes the series*)

Better Private Railway Results in Sweden

Like the Swedish State Railways, the private railways in Sweden have recorded a better net result for most months this year than last. In February the surplus of earnings over expenditure was Kr. 1,250,000 compared with Kr. 800,000 for the same months in 1934; in March the corresponding figures were Kr. 2,110,000 and Kr. 2,070,000 and in April Kr. 2,090,000 and Kr. 1,580,000. It is hoped that the interruption in May of this development will prove only occasional—in that month earnings fell to Kr. 9,040,000 compared with Kr. 9,160,000 in April and Kr. 9,150,000 in March. Nevertheless they were somewhat higher than in May, 1934 (Kr. 8,960,000), and sufficient to yield a surplus over expenditure of Kr. 1,690,000, which is somewhat lower than the Kr. 1,980,000 for May, 1934. The quantity of goods transported rose to 1,440,000 tons compared with 1,330,000 tons in May, 1934, but the number of passengers fell to 2,460,000 against 2,640,000, probably owing to the rather colder weather and later appearance of spring this year. For the first five months of the year the development is in any case favourable, the total takings for the private railways amounting to Kr. 43,540,000 compared with Kr. 40,990,000 for January to May, 1934. The increase is Kr. 2,390,000 in goods traffic and only Kr. 160,000 in passenger traffic. After deduction of amounts for renewal funds, interest, &c., the result of all the private railways together was a net profit of Kr. 820,000 for the period from January to May compared with a deficit of Kr. 330,000 for the same five-month period of the preceding year.

THE HORSE-POWER OF LOCOMOTIVES—ITS CALCULATION AND MEASUREMENT—V

By E. L. DIAMOND, M.Sc. (Eng.), A.M.Inst.C.E., A.M.I.Mech.E.

This is the fifth of a series of articles giving a critical account of the work that has been done in various parts of the world on a subject that today has acquired a new importance in view of the competition between the steam locomotive and other methods of railway traction. The previous articles appeared in our issues of April 12, May 3, June 14, and July 26.

Kiesel's Formula (1915).—In the following year Kiesel's formula, based entirely on the test plant results obtained by the Pennsylvania Railroad, of which he was Assistant Mechanical Engineer, was published.*

Kiesel's formula, like the Baldwin method, assumes to start with a constant boiler evaporation. But, instead of assuming a value for the specific steam consumption, the Kiesel formula evaluates independently the mean effective pressure. This, indeed, is the crux of the method. The formula is,

$$\text{Mean effective pressure} = \frac{2P}{1+E}$$

where P is the cylinder admission pressure (say 10 lb. per sq. in. less than the boiler pressure) and E is the expansion ratio. Thus the mean effective pressure is expressed, not directly in terms of the speed, but in terms of the expansion ratio. This expansion ratio, however, is not the indicated cut-off, but the ratio of the weight of a cylinder full of steam to the weight of steam supplied per stroke on the basis of the assumed evaporation rate, which, of course, will be inversely proportional to the speed. Hence the mean effective pressure is linked indirectly with the speed. It is unnecessary to work out in detail here the derivation of the Kiesel formula, as it follows quite simply from the above explanation. The expression for the expansion ratio reduces to

$$\frac{1.056\ MV}{3\ KH}\ w$$

where M is the "engine constant" (d^2s/D, using the same symbols as in the footnote, p. 140, *R.G.*, July 26), V is the speed in miles per hour, w is the weight in pounds of 1 cu. ft. of steam, K is the evaporation per hour per sq. ft. of heating surface in pounds, and H is the total boiler heating surface (fire side). Substituting this expression in the formula for mean effective pressure, the tractive effort is given by

$$\text{Cylinder tractive effort} = \frac{2\ PM}{1+\left(\frac{110w}{3}\times\frac{MV}{KH}\right)}$$

which is the actual Kiesel formula. The indicated horse-power may be directly calculated from this.

For the constant K some figure must be taken, as in the Baldwin method, which represents the maximum rate of evaporation which the boiler can be expected to maintain in normal service. But in this case the evaporation must be reckoned in terms of the steam actually delivered into the cylinder, and not the total quantity of water evaporated, so that a lower figure must be employed. A. J. Wood, who first published Kiesel's formula, suggested 10 lb. of water per sq. ft. of heating surface per hour for saturated steam and 8 to 8·5 lb. for superheated steam, the total heating surface in this case including the fire side of the firebox, superheater elements, boiler tubes and superheater flues, or being reckoned as the fire side of the evaporation surfaces plus six times the fire surface of the firebox. These are known as Wood's constants.

In Fig. 10 are shown for comparison the horse-power curves for two contemporaneous American locomotives, the E6s superheater "Atlantic" type, and the K4s superheater "Pacific" type. The test curve is obtained from the stationary test plant results, and in this case extrapolation has not been necessary, actual tests at rates of evaporation between 11 and 12 lb. per sq. ft. per hr. having been made over a fairly wide speed range. The precise rates of evaporation are shown alongside each test

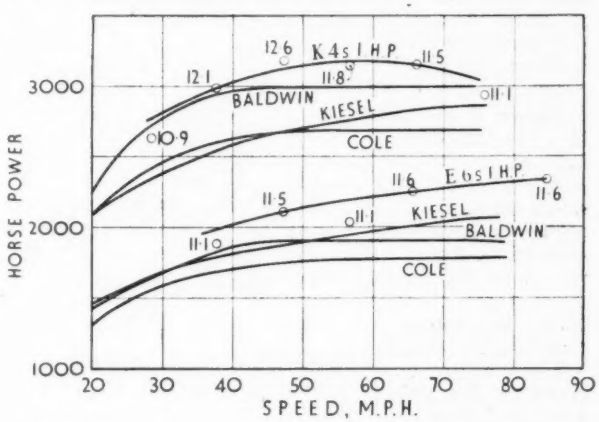

Fig. 10—Horse-power curves for Pennsylvania locomotives

point and the curve is drawn accordingly. The other curves are calculated respectively by the three methods just described.

To calculate the resistance due to internal friction Kiesel gave the following formula:—

$$R = [22 + 0{\cdot}15\ (n-1)\ V]\ Q$$

where Q is the weight on the driving wheels in tons, n is the number of coupled axles, and V is the speed in miles per hour. By deducting the power absorbed in this resistance from the horse-power given by the Kiesel tractive effort formula, the horse-power at the rim of the driving wheels is obtained, and Kiesel preferred to work with this, including the rolling resistance of engine and tender (assumed equivalent to three cars) in that of the train. A separate term must, however, be employed for head wind resistance of the locomotive, for which Professor Goss's formula

$$R = 0{\cdot}1\ V^2$$

is recommended.

Lipetz's Curves (1933).—In 1933 Mr. A. I. Lipetz, consulting engineer to the American Locomotive Company, published* a new method of tractive effort calculation, intended to bring Cole's method up to date, as the latter gives rather low values for locomotives having modern types of superheaters, feed water heaters, and valve

* "Principles of Locomotive Operation," A. J. Wood, New York, 1925, 2nd ed., p. 31.

* Trans. A.S.M.E., 1933, vol. 55, RR–55–2.

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motions. It will be remembered that Cole's original method depended only on the cylinder tractive effort, so that the boiler evaporation factors which constituted his most valuable contribution to the subject, did not enter into the horse-power calculations. Lipetz's method, on the other hand, depends solely on the boiler. It is, in principle, a modification of the Baldwin method, with the advantage that the evaporative power of the boiler can be estimated more exactly on the basis of Cole's ratios.

It differs essentially from the other methods in discarding the constant rate of evaporation as the criterion of maximum performance, Lipetz maintaining that in practice locomotives are not regulated so as to generate a constant amount of steam. He justifies this by plotting curves of evaporation rate for various locomotives tested at Altoona, including the K4s and E6s, taking the maximum performance at each speed. The curves are similar in shape, showing an increase with speed up to a certain limit, and a subsequent falling off, but they vary considerably in their numerical values. This, of course, is due to the fact that only a limited number of tests of each locomotive can be made, and since the test conditions were not always chosen with the primary object of ascertaining the maximum performance, such curves may indicate nothing more than the nature of that choice. Actually the Pennsylvania method of calculating the maximum performance is, as has already been mentioned, to assume that the maximum rate of evaporation could have been attained at the lower speeds had tests been run at a sufficiently high drawbar pull. On the other hand, consideration of the conditions of working for the maximum-power low-speed tests (cut-off and regulator opening) of some of the locomotives tested suggests that the maximum rate of evaporation could not possibly be reached in actual practice, and Lomonossoff's tests* confirm this for many locomotives, so that Lipetz's contention finds considerable justification.

Lipetz attempts to establish standard evaporation coefficients on the basis of road tests. But as road tests do not afford data as to the rate of evaporation at various speeds his method really resolves itself into nothing more than the selection of a standard horse-power–speed curve from the road performances of locomotives of the most modern type. This curve is then referred to the evaporative power of the boiler, calculated by Cole's constants but increased by 7 per cent. to allow for modern improvements, and the ratios so obtained can then be applied to any up-to-date locomotive type in order to calculate its horse-power from the boiler dimensions.

The artifice by which evaporative coefficients are obtained is as follows. The specific steam consumptions corresponding to various points on the standard horse-power–speed curve (plotted from road tests as mentioned) for locomotives as nearly similar as possible, were selected from the published results of the Altoona tests. By multiplying the indicated horse-powers by these specific steam consumptions total evaporation rates are obtained. These Lipetz expresses as percentages of the evaporation rate calculated by Cole's ratios, the maximum, as already mentioned, being 107 per cent. The resulting curve is reproduced in Fig. 11. The reason why the Altoona evaporation rates were not directly used has already been indicated; much better agreement was found between the maximum evaporation curves for various locomotives obtained in this way. It is important to notice, however, that these evaporation coefficients have no rational basis; they are, like the horse-power curve itself, a purely empirical expression of conditions of working as found in practice. But the evaporation coefficients are of no importance whatever so far as the method of power calculation is concerned since the same multiplication ratio or specific steam consumption by which they are obtained is then used as the divisor to obtain the horse-power from the Cole evaporation rate of other locomotives.

The specific steam consumption curve corresponding to Lipetz's evaporation coefficients is shown in Fig. 12. That it is not constant at any part of the speed range does not necessarily imply that it is more correct than the Baldwin and Cole assumptions, since steam consumption may vary at any given speed according to the conditions of working, and Lipetz's empirical power curve postulates different conditions of working from the Baldwin and Cole constant evaporation criteria.

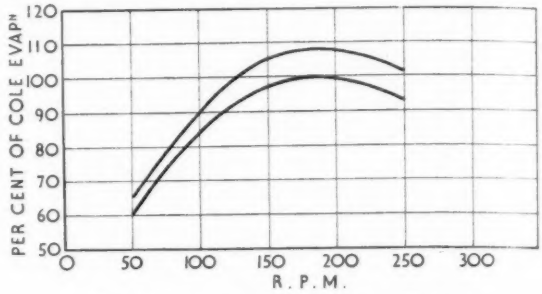


Fig. 11—Lipetz evaporation coefficients

The application of Lipetz's method is quite simple. First the evaporative capacity of the boiler is calculated according to Cole's ratios. This is then multiplied by the coefficients given in Fig. 11 so as to give the actual evaporation at the corresponding speeds. By dividing this by the specific steam consumption rates in Fig. 12 the horse-power at each speed is obtained. In consequence of the very large size of some modern American boilers Lipetz suggested that a limit of 20 per cent. over and above the maximum horse-power given by Cole's method of calculation should be set, but this is the only provision he originally made for variations of the ratio of cylinder volume to heating surface.

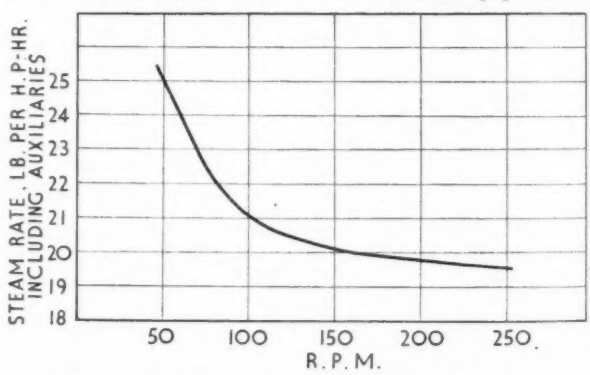


Fig. 12—Lipetz specific steam consumption curve

In Fig. 13 are reproduced two sets of curves for a New York Central 4-8-2 and 4-6-4 locomotive respectively. These show close agreement between Lipetz's horse-power curve and the curves of average and maximum performance obtained from road tests of these locomotives. The "capacity" curves represent the performance of the locomotive at the point at which the boiler begins to fail to maintain steam supply, that is to say, the theoretical maximum performance.

It cannot fail to have been noticed that a very great

* See diagrams in a later article

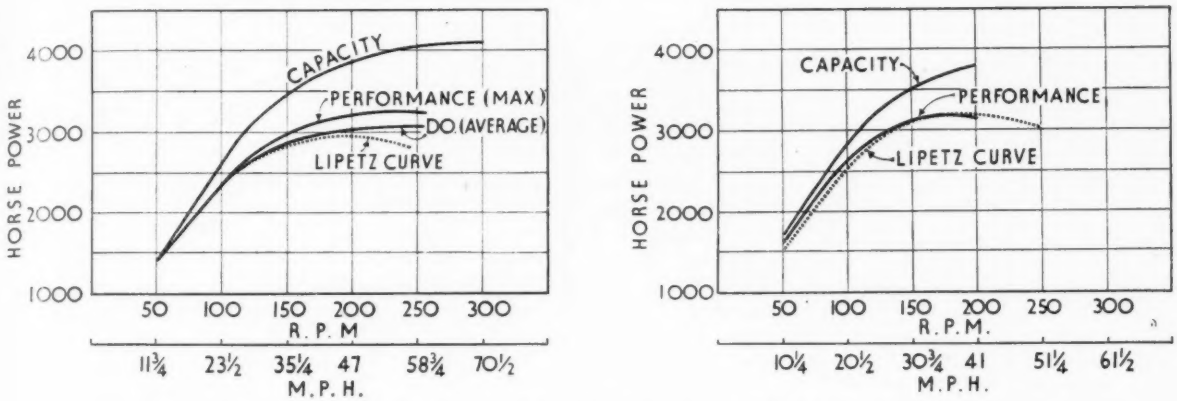


Fig. 13—Comparison between Lipetz curves and test results

difference exists between the cylinder performance characteristics as shown by these diagrams for modern American locomotives and as shown by the curves of Desdouits and Dalby, Fig. 2. Whereas the modern locomotive is capable of maintaining its indicated horse-power at or near its maximum value up to the highest speeds of testing, the cylinder horse-power curves for the earlier locomotives tended to decline as rapidly in the high-speed region as in the low-speed. The reason for this difference, of course, is mainly the improvement of valve motions and cylinder design; the locomotives represented by Fig. 13, for instance, have valve motions with about $8\frac{1}{2}$ in. of valve travel. But this predominant influence of engine design on the performance at high speed does not merely make a hard-and-fast difference between the performance of old and new locomotives. It causes the performance of different locomotives even of modern design to vary between wide limits in the range of speed above 200 r.p.m. This fact Lipetz fully recognised, for he stated that insufficient data are available on which to base a precise method of horse-power calculation above a speed of 200 r.p.m., since such a method would have to take into account, in addition to other factors, valve motion characteristics and areas of steam passages.

Recently Mr. Lipetz has published a supplementary paper* consequent upon his realisation that it is a serious disadvantage of his method, as originally formulated, that it depends solely on the boiler. Actually the locomotives whose performance data formed the basis of his original curves, all had very large boilers, following the practice of his firm. For many other classes of locomotives, however, the original Lipetz method gave horse-powers much lower than can be attained under the conditions for which they were designed, despite the fact that their boilers, according to Cole's criterion, have less than 100 per cent. capacity. Accordingly he proposes a new criterion of boiler capacity, or "locomotive characteristic," namely

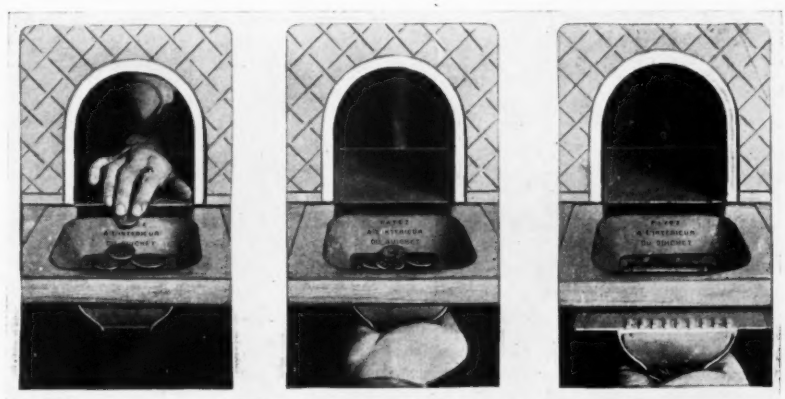
$$K = \frac{E_e}{V_{P_b}}$$

where E_e is the Cole evaporation, V is the volume of the cylinders and p_b is the boiler pressure. For a locomotive having a Cole boiler capacity of 100 per cent. the value of this constant is 14·26 and a series of curves at 50, 100, and 150 r.p.m. give correction percentages for values of this constant less than 14·26, by which the tractive efforts as calculated by the original method must be increased. These curves, like the original curves, are based on an empirical study of performance data.

* Trans. A.S.M.E., 1934, vol. 56, RR—56—6.

Mechanical Delivery of Change

The difficulty of gathering up change at a booking office window, particularly when wearing gloves or in moments of haste, has been overcome by a simple device now installed at the Tuileries station of the Paris Metropolitan. The clerk counts out the change in the ordinary way, but instead of stacking it in a sometimes unmanageable heap on the ledge outside his window, he drops it into a basin-shaped depression formed therein. Beneath the depression is a drawer, which the passenger pulls towards him with upturned palm. This action causes the base of the cavity to open, so that the coins are tipped into the drawer and guided thence into the passenger's hand. The fact that they do not fall into the drawer at once allows the amount to be checked before it is accepted by the action of working the mechanism. The device is the invention of Monsieur A. Chamelon and has been on test for five years at the Tuileries station of the Paris Metro. A new design is now being developed in which the delivery of tickets as well as change will be effected similarly.



SHORANUR-COCHIN CONVERSION, SOUTH INDIAN RAILWAY

Due to the development of the port of Cochin—hitherto linked with the South Indian Railway broad gauge system only by a metre gauge branch—this branch has now been converted to broad gauge

UNTIL the end of October last, 65 miles of metre gauge branch line intervened between Shoranur junction on the South Indian Railway broad gauge system and the rising port of Cochin. It was then that His Highness the Maharajah of Cochin formally opened the branch as a broad gauge line, giving access from all points on the system of that gauge to Cochin harbour without recourse to transhipment—with its heavy cost in labour, delays, and losses due to pilfering—at Shoranur.

The conversion has been carried out by the South Indian Railway administration, and under the direct supervision of Mr. A. R. Edington, Executive Engineer in Charge, working under the orders of the Chief Engineer, who in turn was responsible to the Agent.

Geography and Extent of the Work Involved

The country traversed carries an average density of population of no fewer than 814 souls to the square mile. The principal towns served are Trichur (45,658) and Ernakulam (36,638)—populations in brackets—the latter, situated on the eastern shore of the Cochin backwater, faces the port of Cochin. The first 15 miles of line from Shoranur are in hilly country and the remainder in undulating terrain merging in the last few miles into a sandy coastal plain.

Practically the whole of the 209 metre gauge bridges and culverts had to be either strengthened or replaced by new structures, and the quantity of earthwork involved in widening banks and cuttings totalled 2,39,33,800 cu. ft. The 64·8 miles of line was divided into four approximately 16-mile lengths for distribution between four separate contractors, V. R. Ranade & Sons, The Northern India Construction Company, Mugaseth & Sons and Nathu Megar. Work was started about the middle of 1931. As heavy metre gauge sleeper renewals were required on the branch, 10 miles of line were re-sleepered completely with broad gauge sleepers adzed for both broad and metre gauge rails. The sleepers were bored at one end only for both broad and metre gauge spiking prior to going into the track, when the other metre gauge spike holes were bored to suit the gauge. Sleeper spacing had to be worked out to suit both the old 30-ft. metre gauge (m.g.) rails and the 40-ft. broad gauge (b.g.), 90-lb. rails.

Sketch map of the Shoranur-Cochin line, South Indian Railway, recently converted from metre to broad-gauge

Owing to many of the metre gauge curves being too sharp for the b.g. alignment, they had to be realigned, some 13 miles of the centre line being changed, and nearly half of that distance constituted what was practically new construction work. To facilitate final gauge conversion, the m.g. track was diverted to the new alignment as soon as the formation was ready for it; this occurred at about 30 different places in all. The diversion was carried out between trains and from one end, the track on each abandoned m.g. alignment being used for the next re-aligned section ahead.

Where the existing formation was retained, 7 cu. ft. per ft. run of additional ballast were added. On new formation a mattress of moorum cutting spoil was used until the embankments consolidated, and finally 12 cu. ft. per ft. run of granite ballast was used. The line is fenced only at level crossings. Reinforced concrete mile and gradient posts have been furnished throughout. There are 83 level crossings; practically all old ones have had to be remodelled, many involving considerable earthwork. Several new ones have also had to be provided.

Bridgework

The heaviest single work was the Ponnani bridge close to Shoranur. Here is a new bridge consisting of 14 60-ft. girder spans, supported upon piers and abutments resting on 12 deep well foundations and three open founds. The wells are 30 ft. in diameter with steining 6 ft. thick. Unexpected floods hampered the work, but it was accomplished without serious damage or undue delay.

There are 18 other major bridges two of which are new, three were re-girdered and strengthened and six had their masonry only strengthened. To avoid costly diversions, the track at most of these bridges was carried temporarily upon rolled-steel-beam spans supported on sleeper stacks and inserted under the track between trains, generally in piecemeal stages. There were eight overbridges, all of which had to be rebuilt to suit b.g. dimensions, and a ninth also was added. Altogether no fewer than 207 bridges of all kinds had to be either strengthened or reconstructed. In addition to the 11 major underbridges, 175 minor bridges have been newly built or completely rebuilt in less than 2½ years without interference with traffic. The avoidance of diversions alone could have achieved this feat and considering that foundation work was possible during only 11 months in all during this period, and then intermittently, and was often delayed by sudden and unexpected floods, the result was very

Ponnani bridge, close to Shoanur junction, consisting of 14 spans each of 60-ft. girders, with well foundations for 12 of the piers

Conversion work in progress in Ernakulam yard

Last metre-gauge train ready to leave Ernakulam

creditable. It may be mentioned that the masonry is in exceptionally high class stonework.

In the later stages work proceeded strictly in accordance with a definite programme. Re-sleepering to provide 16 sleepers to the 40-ft. b.g. rail-length was completed by January, 1933. The b.g. rails were laid outside the m.g., but without bearing plates at joints until after the conversion. Owing to the disparity in height between the 41¼-lb. m.g. and the 90-lb. b.g. rails, cut sleepers alternating with those of the b.g. were used at all level crossings for the m.g. track, which was ramped across with grades of 1 in 100 at each side. Similarly, to avoid delay on the day of conversion, all b.g. points and crossings were inserted—complete with interlocking fittings but minus only one lead rail—under the m.g. track, which was ramped over them with 1 in 100 approaches.

To reduce the lengths of block sections, five intermediate stations were converted into crossing stations. Meanwhile all platforms were raised and other works carried out.

As a proof that there was little interference with public traffic it is noteworthy that goods tonnage over the line increased from 258,674 in 1930-31 to 343,698 in 1933-34 and in the four months April-July, 1934 was 155,638. The previous highest tonnage (in 1928-29) was only 270,893.

The Duplex system of signalling and interlocking, Stage I, has been adopted throughout. Terminal arrangements at Ernakulam included the provision of an 85-ft. turntable supplied by Head Wrightson & Co. Ltd., and the modification of the old engine shed, provision of extra watering arrangements, &c.

All b.g. trackwork was made ready beforehand, except where it interfered with the m.g. track, only the slewing at stations and removal of m.g. points and crossings and bringing into use of those of b.g. were therefore necessary on the day of conversion. To reduce this last-minute work, six crossing stations were closed for m.g. crossing purposes beforehand.

On October 23, 1934, the line was closed to traffic after the passage of the last m.g. train, which left Ernakulam at 16.25 hr., and the work of conversion started. By 3.30 hr. on October 24 all work was completed except near Shoranur, where the track had to be cut and considerably realigned to connect with the new entrance to the junction. By 6.0 hr. the Government inspection special left Shoranur for Ernakulam. After stops to inspect stations, points, &c., and for testing specimen bridges of each type, Ernakulam was reached before midday. Thus the change over was effected by 600 men working from the afternoon of 23rd to noon on 24th.

Subsequently a number of additional buildings and other works and the dismantling of the m.g. permanent way had to be carried out, but otherwise the line was, as stated, complete and ready for b.g. traffic of all kinds on October 24. The satisfactory conclusion of this work reflects much credit upon the staff concerned, considerable forethought and detailed programming being necessary at every stage of the conversion.

NEW METRE GAUGE LOCOMOTIVES FOR INDIA

These are standard 4-6-2 YB type engines for the Bengal & North Western Railway

(See illustrations opposite)

EIGHT new 4-6-2 type passenger locomotives of the standard YB type have recently been constructed by Nasmyth, Wilson & Co. Ltd. of Manchester, for service on the metre-gauge Bengal & North Western Railway, and one of the engines is, by the courtesy of the firm, illustrated herewith. As seen, the cylinders are placed outside the frames and drive the middle pair of coupled wheels; steam distribution to the cylinders is effected by means of Caprotti valve gear. The boiler is of large proportions and carries a working pressure of 180 lb. per sq. in. It is equipped with the Superheater Company's superheating apparatus and ACFI feedwater heater.

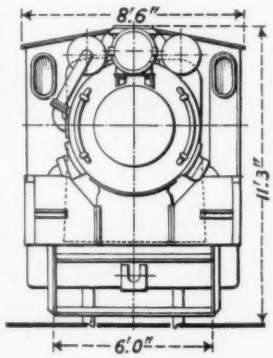
The locomotives, which have been constructed throughout to the specification and inspection of Messrs. Rendel, Palmer & Tritton, consulting engineers to the Bengal & North Western Railway, have the following main particulars:—

Cylinders, dia.	16 in.
Piston stroke	24 in.
Wheels, coupled, dia.	4 ft. 9 in.
,, leading bogie, dia.	2 ft. 4½ in.
,, trailing	2 ft. 6 in.
Wheelbase, coupled	10 ft. 6 in.
Total (engine)	27 ft. 10 in.
Boiler working pressure	180 lb. per sq. in.
Heating surface—	
Superheater (inside)	265 sq. ft.
Tubes	1,027·5 ,,
Firebox	124 ,,
Total	1,416·5 ,,
Grate area	23·1 ,,

The engine in working order weighs 52·9 tons and with the eight-wheeled tender, which has a tank capacity of 3,000 gallons of water and a coal capacity of 7 tons, the total weight in working order is 92·15 tons. The engine develops a tractive force at 85 per cent. boiler pressure of 16,492 lb., the ratio of adhesion to tractive force at the same percentage being 4.

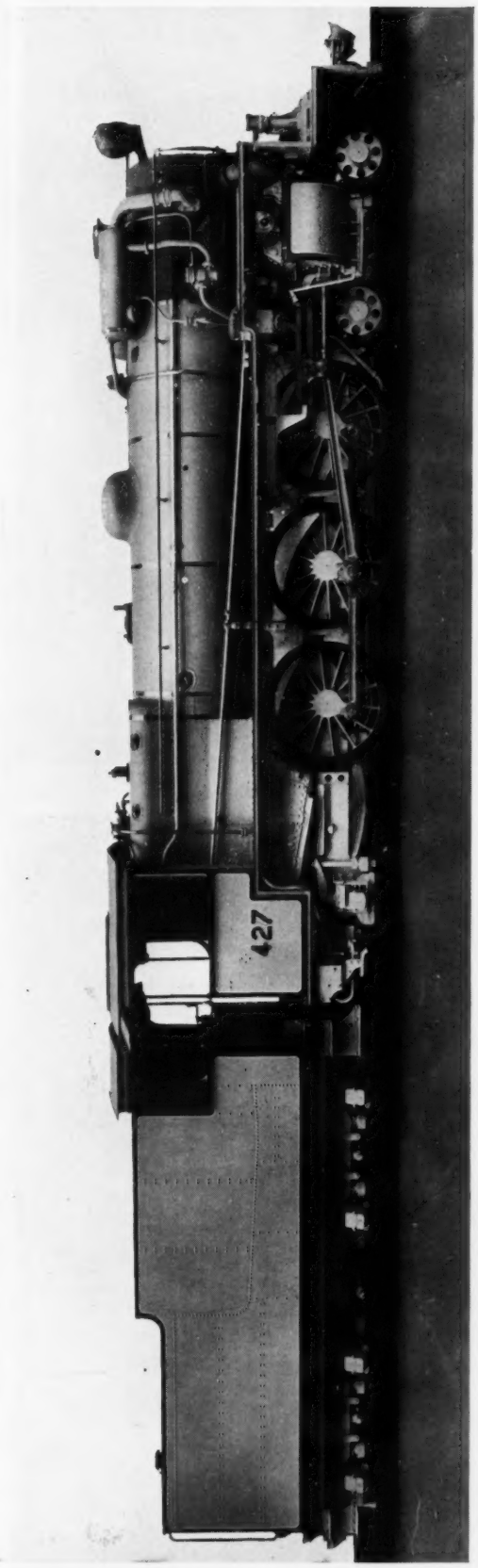
The equipment of the locomotive is of a very complete description and in addition to the items already mentioned the following are included:—

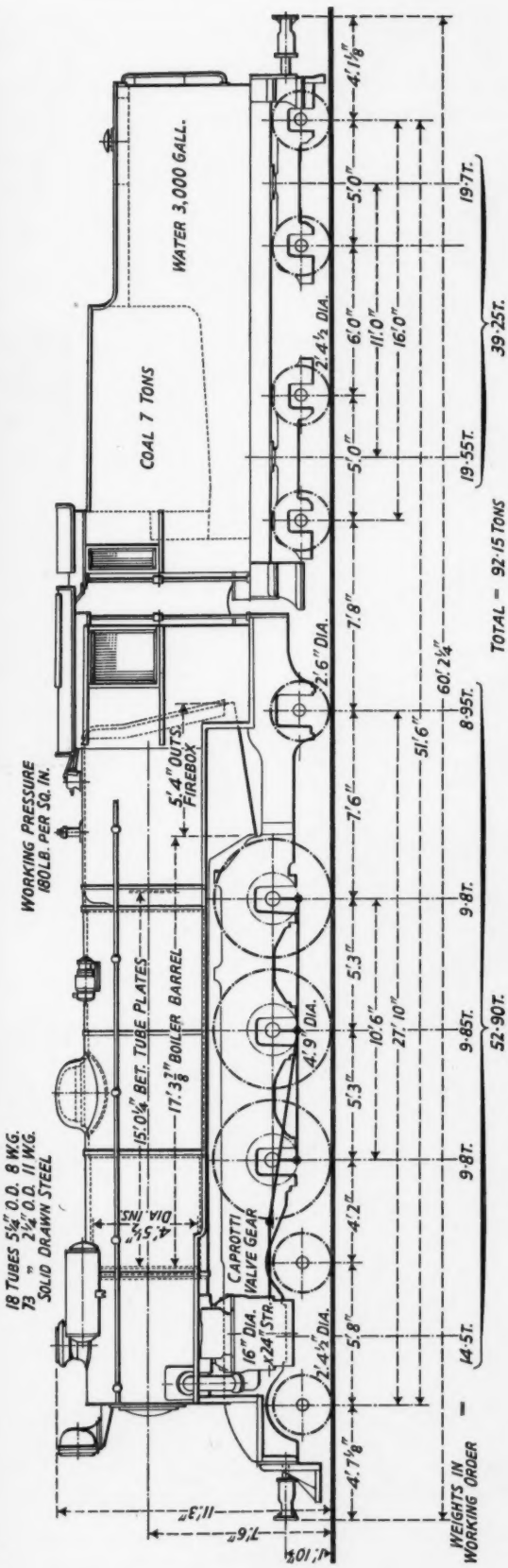
Spencer Moulton rubber springs, Wakefield lubricator, Parry tube cleaner, Vacuum Company's brake equipment, Gresham & Craven injectors, Whitelegg & Rogers Tecalemit oil guns and grease lubrications, Lambert sanding gear, Stones' electric lighting equipment, A.B.C. Central couplers, Flannery firebox staybolts, Ross pop safety valves, and Cape Asbestos Company's asbestos mattresses.



Front end view

SCOTTISH SHEEP SALES.—Over 250 sheep sales, at the largest of which as many as 35,000 head are expected to be put up for sale, have been arranged to take place during the autumn at 30 centres in Scotland and the Border counties served by the L.M.S.R. Besides the running of many sheep sales expresses in connection with the sales, the L.M.S.R. will have in operation special rates for sheep traffic involving a substantial reduction, on a sliding-scale basis, for large numbers of animals. Insurance against death or injury is arranged.

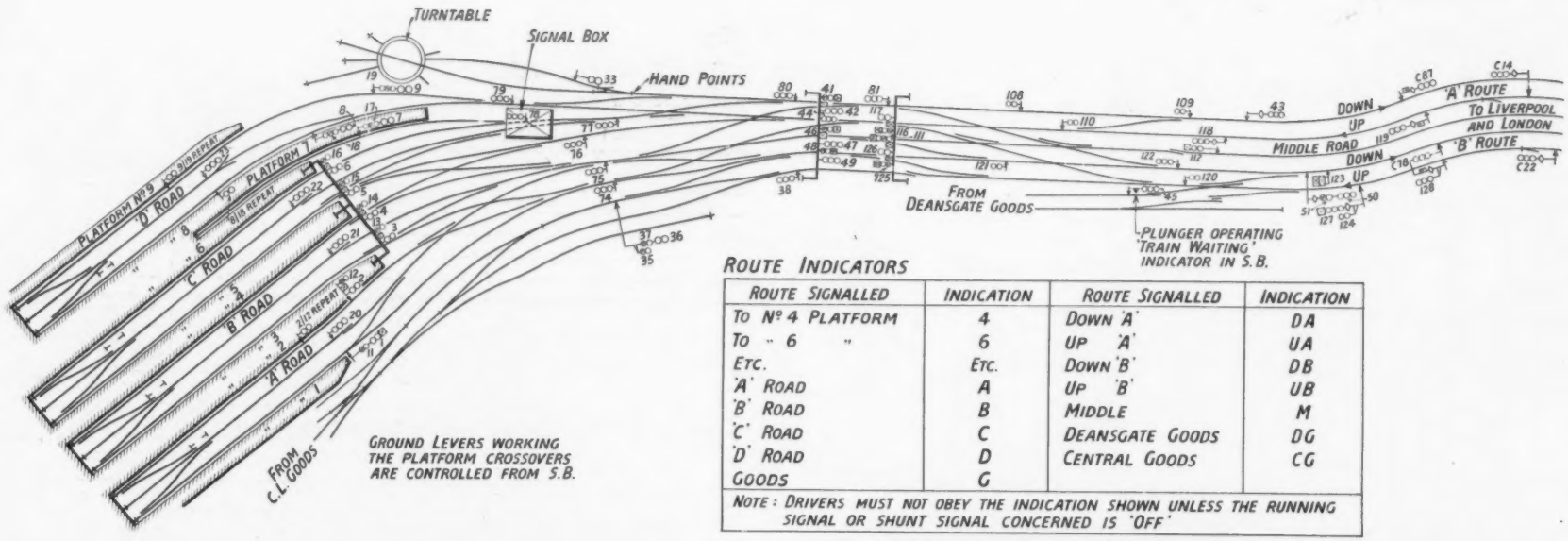




4-6-0 *Type XB passenger engines : Bengal & North Western Railway*

NEW METRE GAUGE LOCOMOTIVES FOR INDIA

(*See article on opposite page*)



ROUTE INDICATORS

ROUTE SIGNALLED	INDICATION	ROUTE SIGNALLED	INDICATION
To Nº 4 PLATFORM	4	DOWN 'A'	DA
To " 6 "	6	UP 'A'	UA
ETC.	ETC.	DOWN 'B'	DB
'A' ROAD	A	UP 'B'	UB
'B' ROAD	B	MIDDLE	M
'C' ROAD	C	DEANSGATE GOODS	DG
'D' ROAD	D	CENTRAL GOODS	CG
GOODS	G		

NOTE: DRIVERS MUST NOT OBEY THE INDICATION SHOWN UNLESS THE RUNNING SIGNAL OR SHUNT SIGNAL CONCERNED IS 'OFF'

General arrangement of new signalling at Manchester Central station, Cheshire Lines Committee, and (below) exterior and interior views of new signal box

RESIGNALLING MANCHESTER CENTRAL STATION

The work of four boxes at this Cheshire Lines Committee station has been concentrated in one, and colour-light signalling and power operation of points installed

A GOOD deal of the work done by the Cheshire Lines Committee is connected with some of the important main line services of the owning companies and thus its activities come less under notice. Before grouping the C.L.C. helped the Midland in an attempt to compete with the L.N.W.R. for the Liverpool-London and the Manchester-London traffic, and the Great Central to reply to the L. & Y. Liverpool-Hull services. What was conspicuous, however, was the admirable hourly service between Liverpool and Manchester which, with a call at Warrington, was done in 45 minutes, whilst three trains daily in each direction did the journey non-stop in 40 minutes. They were composed of very fine stock, belonging to the committee, with power supplied by the M.S. & L.—later the Great Central—including at one time some of Charles Sacré's best engines.

The original Cheshire Lines comprised five undertakings, which were vested jointly in the M.S. & L., Midland, and G.N. Companies, in 1865, and the Cheshire Lines Committee was incorporated in 1867. Dealing only with the Manchester Central station, we would say that it was sanctioned in 1872; part was opened and the hourly service mentioned above inaugurated on July 9, 1877, and the permanent station brought into use on July 1, 1880. The Midland obtained power in 1873 to build the Manchester South District Railway which was opened, as between Heaton Mersey Junction, Stockport and Throstle Nest Junction, Manchester—both junctions were on the Cheshire Lines—on January 1, 1880, and so gave that company what was practically its own route into Manchester. In 1886 the M.S. & L. was authorised to build the Fallowfield connecting line, which joined the Midland new line at Chorlton-cum-Hardy; later, the length between that point and Throstle Nest Junction was transferred to the Cheshire Lines Committee. The new line gave the M.S. & L. a Liverpool-Hull service through Manchester.

Additionally to the important main line trains for the committee's own services to and from Liverpool, Chester and Southport, the L.M.S. to Derby, Bristol and London and the L.N.E. to Sheffield, London and Hull, there is now a vast and rapidly growing residential traffic. Further, there are two big goods yards. Every kind of business has so increased of late years that the committee considered the working would be simplified were power signalling and track circuit installed, and last autumn the work was ordered.

Manchester Central station itself was protected by two signal boxes: Central Station B and Central Station A. The former, containing 115 mechanical levers, was, as may be seen in our view of the exterior of the new box, at the end of platforms Nos. 7 and 8. Signal box A, with 52 levers, was immediately outside the station, near the points in A route of the double crossover junction between those lines and B route lines. At the junction in the B route line with the Deansgate Goods Warehouse lines was the Great Northern Junction box, containing 24 levers, and 569 yards south of A box was an

Layout outside the signalbox, showing point mechanisms and three-aspect shunting signals in the foreground, and platform starting signals in the background

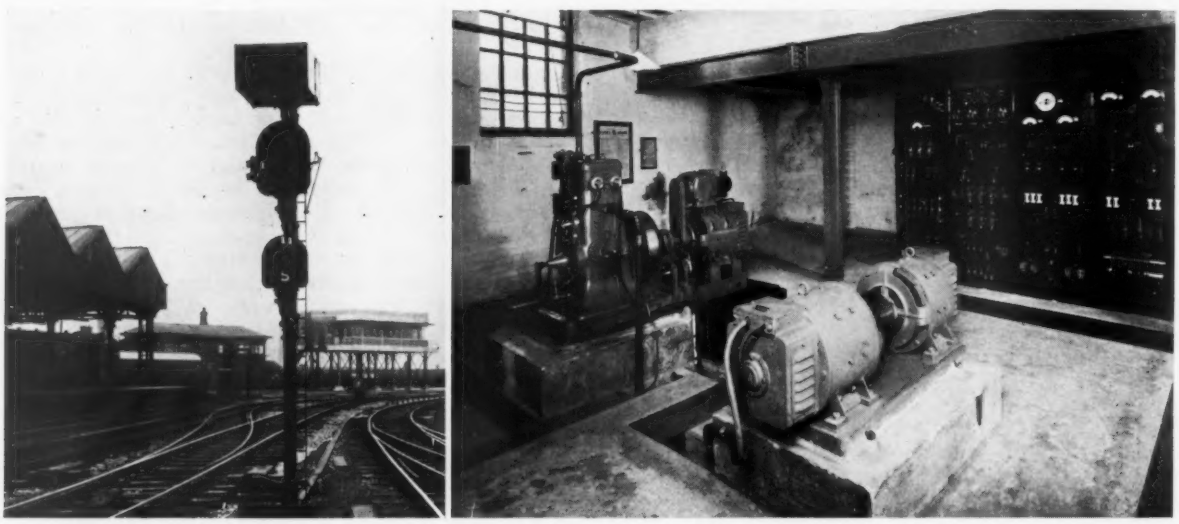
XUM

intermediate block post known as Viaduct Box, with 30 levers. About 1,160 yards south of the last-named box is Cornbrook West Junction where there is, in A route, a double junction with the Manchester South Junction & Altrincham Railway and a double crossover junction between the A route and B route main lines. The first four signal boxes referred to above, in and immediately outside the station, with their total of 221 mechanical levers, have been replaced by a power-operated box with a locking frame of 128 levers. Track circuit has been provided in all the roads, except the middle lines, in the station and it extends along all four running roads to Cornbrook West Junction. The outer home signals at the latter box are Nos. C.87, C.78 on the accompanying signal diagram and the up starting signals are Nos. C.14, C.22. It may be noted that the direction of the up and down lines are respectively to and from Manchester.

There are eight platform roads of standard length in the station, together with No. 7 platform line which is slightly shorter. Between platform roads Nos. 1 and 2, 3 and 4, 5 and 6 and 8 and 9 there is a middle road, with crossover at the buffer stops. The safety points in middle road D are of the " staggered " type. Trains can arrive in any platform road off either the up A route or the up B route, and can similarly depart for either the down A route or the down B.

Points are actuated by the General Railway Signal Company's model 5A. d.c. machines, fed from a 120-volt battery, situated in the signal box. These machines are self-contained: Motor, operating mechanism, point lock, motor control contacts and detector contacts. A special feature is the provision made to bring the movement to rest without a shock, by means of a dynamic snub—a current generated by the motor after the machine has performed its work—being caused to flow through the motor and control wires on closed circuit. The energy in the moving parts is expended in generating this current and the machine brought to rest without shock. Individual a.c. detection circuits are employed and no additional wires are required for that purpose. The transformers necessary for energising the detection circuits are designed to provide current for the detection relay only, so affording protection from the effects of crossed wires, &c. Our illustration of the lay-out outside the new box shows several typical point machines, and from it their compact character, method of attachment to the sleeper ends and the little obstruction they cause in the " six-foot " will be appreciated.

All signals are of the multiple-lens, colour-light type, with either three-aspect or two-aspect indications. The running signals have long-range optical systems and the shunt signals have short range. Many signals have, as shown on the signal diagram, route indicators, giving, by numerals or letters, information as to the road for which the signal applies. The arrival signals and the departure directing signals have long-range route indicators and the platform starting signals and the minor running movements have short-range. The very commendable step, which we first noticed at King's Cross, of making the indications visible on both sides of the post—and so, incidentally, warning men working on the line of the direction to be taken by approaching trains—has been adopted. As a typical signal, we illustrate the two-aspect starting signal from No. 1 platform road, worked by No. 1 lever, with its route indicator above and a shunting signal, operated by No. 11 lever, below. Normally there is no light in the latter signal; when put to " clear " a green and the sign S. appear. Calling-on signals, as used to show that the platform concerned is occupied, have no light normally but, when changed, show yellow and the sign C. Shunting signals have either two lenses or three. The same illustration that shows the point mechanisms also illustrates, reading from left to right, shunting signals Nos. 74, 75 and 76. Telephones have been provided at the outer up home signals and at Cornbrook West down home and up starting signals.



Left: Platform starting signal, with route indicator above and shunting signal below; disused central B box and exterior of new box viewed from the north in background. Right: Power house with standby equipment

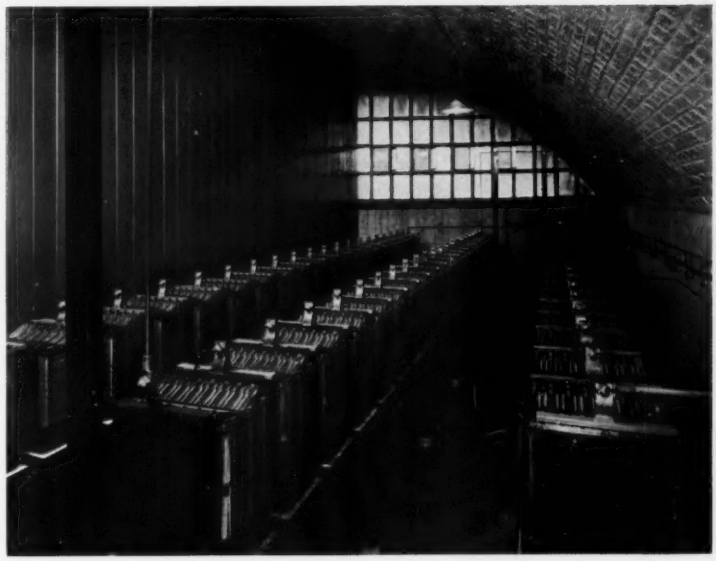
Complete sectional release route locking is provided to enable the track lay-out to be used to its maximum capacity. Automatic time releases, of the thermal valve type, are also used to provide an emergency release of the route locking in the event of a train breaking down in the section. Rotation locking has been provided between the platform starting signals and the directing signals Nos. 42, 47, 49 on the outgoing gantry and between the up home signals Nos. 118, 127 and the directing signals Nos. 117, 126 on the incoming gantry.

In view of the large number of shunting movements

that take place from platform to platform and to and from the engine turntable, a special route locking circuit has been designed to distinguish between running and shunting movements. Thereby the levers that work shunting signals can be restored in order to enable a shunting-back movement to be made, but the route locking of the points is held until the whole movement has been completed. When one of the running signals has been used no change can be made. Should an emergency arise that calls for a release, that can be done by a thermal relay affecting the release after a time limit—in this case one minute.

The new signal box is fixed in such a position as to give the signalmen an excellent view of the yard in all directions. Observation platforms, it will be seen from the illustrations, are provided on the gantry at each end of the box, and to maintain easy communication with the ground staff, loud-speaking telephones have been installed.

Another illustration shows the interior of the signal box and its locking frame of 128 levers. The alternate upturned and down-turned handles, though fixed at 2 in. centres, give ease of manipulation. The interlocking is all electric, using one lock for each slide. The bottom line of the rows of lights above the lever numbering is an indication that shows whether the lever is free or locked; when free there is a white light, whilst no light signifies that the lever is locked. The latter condition operates by either a conflicting lever movement or by the presence of a train on a track circuit concerned. The other rows of lights are either for N. or R. for points or the repeater lights of the two or three aspects of signals. The illuminated diagram represents 75 track circuits. Above the frame on the right are the train describers.



View in the battery room

Track Circuits and Power Supply

The track circuits are of the condenser-fed type. The track feeds and the track relay feeds to the rails are single Ancalite insulated wires, carried in trunking mounted at sleeper level and brought out to the rail terminal levels through wooden travelling risers. The track apparatus cases are of the welded-steel type, with two half-doors. There are three cables at each apparatus case; one contains all the point controls, another the track relay leads and the third has the signal controls. Paper-insulated lead-covered cables are used from the apparatus cases to the relay room in the signal box. A view of this room is given; it leads off the operating floor of the box. The pot ends of the cables are arranged on the pot-ending boards of the relay rack and the various types of cables are placed together.

The power supply is 400-volt, three-phase, 50 cycles. Scott-connected transformers are used to give two single-phase supplies of 400 and 110 volts, 50 cycles. The main transformers are in duplicate to provide a stand-by. A reversible alternator d.c. machine motor generator set is used, driven from the a.c. side, to charge a battery normally used for point operation, or driven from the battery to supply a.c. current to the signal system in case of power failure from the mains. This latter condition is used only to prevent a drop in voltage, while a diesel alternator set, which normally stands idle, is automatically started up and synchronised with the alternator of the motor generator set. The signal load is then transferred to the engine set and the motor generator set again charges the battery.

Interior of relay room

The description given above and the signal diagram we reproduce show this to be an uncommonly compact operating job. The main credit for the design and supervision of the undertaking is due to Mr. K. C. Marrian, the Committee's Resident Engineer, and his staff. The contractors for the signalling were the General Railway Signal Company, whose sub-contractors for the cables were Callender's Cable & Construction Company. The switchgear for the main power supply, together with the whole of the stand-by plant, was provided by the General Electric Company.

XUM

WATER SOFTENING PLANTS FOR THE L.N.E.R.

Twenty-two plants are being erected at the present time at various points on the company's system

WATER softening plants to the number of twenty-two are at present being installed by the London & North Eastern Railway for treating locomotive boiler feed water, and work is progressing so well that certain plants are already in operation, whilst others will be brought into use almost immediately. Thirteen of the plants are located between King's Cross and Doncaster and nine sites have been chosen for the remainder of the Great Eastern Section. This extensive scheme is the direct result of the very careful research carried out during the past few years by the company's mechanical engineers and chemists. In addition to ascertaining where, owing to the hardness of the water supply available, it was necessary to install the softeners, extensive chemical experiments have been conducted to determine the best type of water softener for use in each locality, in order that the number of degrees of hardness might be reduced to a minimum.

A Boby plant at Bawtry, L.N.E.R., with a capacity of 20,000 gallons an hour, which softens the water for the Scrooby troughs. The structure below line level houses the pumps which deliver River Idle water to this plant and to the 40,000-gallon-an-hour plant at Red Bank, Doncaster

Plants are being installed having capacities ranging from 5,000 to 40,000 gallons an hour to suit the conditions at various points. Hydrated lime, soda ash, and a coagulant sodium aluminate are added in quantities determined by the composition of the raw water. The lime and soda process effects the removal of the scale forming material from the water before it is fed to the locomotive boilers. The plants are designed to secure sufficient sedimentation and the soft water is filtered through wood wool before delivery to the storage tanks for service. Sludge which accumulates in the conical base portions of the plants is periodically discharged and dumped. Owing to the characteristics of the waters in the different areas, it has been found that the need for water softening is more pronounced in the south, and hence the installation of the softening plants at the principal depots on two sections of the main line in this area.

The illustration shows the plant installed at Bawtry, which has a capacity of 20,000 gallons an hour. During the year 1934 the plants in operation on the L.N.E.R. removed by softening 1,136 tons of scale-forming material, and when the present schemes are completed a total of forty plants in the North Eastern and Southern Areas will have a combined capacity for treating 3,000 million gallons of water a year, and scale formation to the extent of about 4,000 tons a year will be prevented. The points at which the various water softening plants are located and the names of the makers are as follow:—

Location	*Firm*
King's Cross	William Boby & Co. Ltd.
Hornsey, Ferme Park	William Boby & Co. Ltd.
Langley	Becco Engineering & Chemical Co. Ltd
Hatton	Horseley Bridge & Thomas Piggott Ltd.
Offord	Horseley Bridge & Thomas Piggott Ltd.
Warrington	The Kennicott Water Softener Co.
Essendine	Horseley Bridge & Thomas Piggott Ltd.
Grantham	Horseley Bridge & Thomas Piggott Ltd.
New England	Horseley Bridge & Thomas Piggott Ltd.
Muskham (Trent viaduct)	Paterson Engineering Co. Ltd.
Retford	Horseley Bridge & Thomas Piggott Ltd.
Scrooby (Bawtry pumping station)	Paterson Engineering Co. Ltd.
Doncaster (Red Bank)	Paterson Engineering Co. Ltd.
GREAT EASTERN SECTION	
Clacton	Not yet placed.
Colchester	Not yet placed.
Ipswich	Kennicott Water Softener Co.
Parkestone (Harwich)	Kennicott Water Softener Co.
Lowestoft	Not yet placed.
Norwich	Not yet placed.
Liverpool Street	United Water Softeners Ltd.
Stratford	William Boby & Co. Ltd.
Southend	Not yet placed.

(*See editorial comment, page* 359.)

Public Funds for Level Crossing Abolition

In 1933 and 1934 the United States Congress allotted sums of four hundred million and two hundred million dollars respectively for road construction work, including the abolition or protection of level crossings. For the current year the proportion of its share to be used by each state for the latter purpose was fixed according to its railway mileage, as in some cases no work of this kind had been undertaken with the aid of earlier grants. Up to January 31 last, for example, four states had made no apportionment to level crossing improvement, while Illinois had allocated a quarter of its share to seventy-eight projects of this kind. Although the number of level crossings increased by 669 from 1926 to 1933, the new ones established in that period, in common with the vast majority of the 235,000 now existing, carry very little traffic. It was decided to use the latest grant for eliminating 3,000 of the most dangerous crossings, and although that would represent an insignificant proportion of the total, it would remove those with the worst record of accidents. Already a decrease is noted in level crossing mishaps, and since the total of road accidents indicates no improvement in the caution of motorists, it appears that the work so far carried out has been efficacious.

RAILWAY NEWS SECTION

PERSONAL

Mr. James McCrea, Managing Director of the Belfast Omnibus Co. Ltd., has been appointed General Manager of the new Northern Ireland Road Transport Board.

Mr. J. T. Rodwell, O.B.E., Electrical Engineer of the Cordoba Central Railway, is now in England on leave from Argentina.

The Hon. C. P. Fullerton, K.C., Chairman of the Trustees, Canadian National Railways, is at present making his first visit to Europe since he assumed that office in January, 1934. He has already visited the C.N.R. offices in London and the agents in France and Belgium.

Mr. J. P. Rhys, Chartered Surveyor, P.A.S.I., of the Surveyors and Estate Office, Great Western Railway, has been successful in this year's examination of the Chartered Surveyors' Institution for the special diploma, town planning, and is being awarded the diploma. Mr. Rhys has contributed to the columns of THE RAILWAY GAZETTE from time to time on land questions as affecting railways.

At a recent meeting of the board of directors of the Canadian Pacific Railway Company, held in Montreal, the Hon. J. Marcelin Wilson was elected a director to fill the vacancy created by the death of the Hon. Frederick L. Beique, K.C. The Hon. J. M. Wilson is Chairman of La Banque Canadienne Nationale, President of the Windsor Hotel, Limited, and a Director of the Montreal Light, Heat, and Power Consolidated and of the Montreal Island Power Company.

It is with regret that we learn of the death, on August 25, of Mr. William Kendall, for many years Deputy Agent of the Burma Railways. Mr. Kendall was very popular among his fellow officers, and was greatly esteemed in Government and commercial circles in Rangoon. He was also well known in India, where he sometimes represented Burma at sessions of the Indian Railway Conference Association. His son-in-law, Mr. E. V. M. Powell, is a District Locomotive Superintendent on the Burma Railways.

Mr. David Lionel Clarke, who, as announced on p. 349 of last week's issue, has been appointed Chairman of the Northern Ireland Road Transport Board, was born at Galway on September 25, 1885, the son of the Very Rev. J. Courtenay Clarke, D.D. He was educated at Galway Grammar School and Queen's College, Galway, and was a graduate of the Royal University of Ireland in 1906. Mr. Clarke was admitted as a solicitor to the Supreme Court of Judicature in Ireland in 1910, and in 1914 was appointed Local Government Auditor for the Local Government Board for Ireland. He was appointed Accountant and Establishment Officer, Ministry of Home Affairs for Northern Ireland, in 1921; Principal Officer, Ministry of Home Affairs, in 1925; and Assistant Secretary in charge of Local Government Department, Ministry of Home Affairs, in 1927—the last named department includes supervision of roads, traffic, and transport. In 1928 he presided over the inquiry directed by the Ministry of Home Affairs into transport conditions in the City of Belfast, and conducted the negotiations on behalf of the Ministry which led to the control of road passenger transport in Northern Ireland. Mr. Clarke was a member of the Rates and Fares Tribunal appointed by the Governor of Northern Ireland under the Motor Vehicles and Road Traffic Act (Northern Ireland), 1929, and presided over by Sir Lynden Macassey, K.B.E., K.C. He was responsible for the negotiations preliminary to the passing of the Road and Railway Transport Act (Northern Ireland), 1935, under which measure the Northern Ireland Road Transport Board has been set up. In 1934 Mr. Clarke acted as Chairman of the commission appointed by the Minister of Home Affairs for Northern Ireland to inquire into the system of market tolls. Mr. Clarke received the O.B.E. in 1923.

Mr. David Lionel Clarke,
Who has been appointed Chairman of the Northern Ireland Road Transport Board

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We regret to record the death, on August 28, of Mr. Robert John Hose, a Director of the Antofagasta (Chili) and Bolivia Railway. He was also a Director of the Anglo-South American Bank Limited.

Sir Archibald Gold, D.L., whose death on August 21 at the age of 64, was briefly recorded last week, had a long connection with the accumulator industry. He was a partner with the brothers Pritchett in the early '90's, and subsequently a director of Pritchetts & Gold Limited, when that company was formed in 1901. On the absorption of the Electrical Power Storage Co. Ltd. by Pritchetts & Gold Limited in 1915, Sir Archibald became a director of Pritchett & Gold and E.P.S. Co. Ltd., until, on the death of Mr. George Pritchett in 1920, he was elected Chairman of the company, which had by then amalgamated with Peto & Radford. He remained Chairman till his retirement in 1933. During his chairmanship the firm celebrated in 1932 the 50th anniversary of the formation of one of its constituents, the Electrical Power Storage Co. Ltd.

We regret to note the death, on August 25, of Mr. G. P. Wainwright, M.I.Mech.E., for many years London representative of George Turton, Platts & Co. Ltd. Mr. Wainwright, was the son of Mr. W. Wainwright and brother of Mr. Harry S. Wainwright, who were successively Carriage Superintendents of the South Eastern Railway, the latter becoming Locomotive and Carriage Superintendent of the joint

South Eastern & Chatham system in 1899, and retiring in 1913. Mr. G. P. Wainwright served his apprenticeship at Ashford, and was afterwards for some time Assistant Locomotive Superintendent, Kentish Town, Midland Railway. He joined George Turton, Platts & Co. Ltd. as London representative, and held this post for about 25 years until incapacitated by ill-health about seven years ago, when he retired. Mr. Wainwright was a member of the Institution of Mechanical Engineers, and his genial temperament made him very popular with all who knew him.

Mr. R. A. Riddles, who, as announced in THE RAILWAY GAZETTE of August 9, has been appointed Principal Assistant to the Chief Mechanical Engineer, London Midland & Scottish Railway, entered Crewe works as a premium apprentice in 1909. He saw war service with the Royal Engineers from 1914-19, and in December, 1920, was appointed Assistant to the Works Manager at Crewe, where he subsequently became Progress Assistant in 1925. Three years later Mr. Riddles was promoted to be Assistant Works Superintendent at Derby, and in 1931 was transferred to Crewe in a similar position. In August, 1933, he was appointed Locomotive Assistant to the Chief Mechanical Engineer, at Euston, the position he now vacates to become Principal Assistant.

Mr. R. A. Riddles,

Appointed Principal Assistant to the Chief Mechanical Engineer, L.M.S.R.

We regret to record the death, on August 24, of Mr. Wilfrid Spencer, who has for many years represented B. & S. Massey Limited, of Openshaw, Manchester.

Mr. George Barnard, M.I.E.E., Engineer for the Birmingham and Midland district to Callender's Cable & Construction Co. Ltd., who has been in its service over 50 years, has been appointed an Advisory Director of the company.

Mr. R. P. Ormsby, Secretary of the Canadian National Railway Company and various allied and controlled companies, has retired from the service at the age of 66 and is succeeded by Mr. W. H. Hobbs, Assistant Secretary of the company.

Mr. Ormsby was born in Ireland in 1869 and educated in England. He graduated at Cambridge University in 1891 and went to Canada in 1896, where after various experiences he became Secretary to Mr. Z. A. Lash, K.C. in April, 1902, when Mr. Lash began to act as Legal Adviser to the Canadian Northern interests. He thus acquired, from an early date in the Canadian Northern organisation, an intimate knowledge of its affairs and, practically speaking, attended to the secretarial duties though without title for some years. In those days the organisation was not departmentalised as it now is, and Mr. Ormsby was entrusted by Sir William Mackenzie with completing the arrangements for a loan in New York. This started Mr. Ormsby on a long course of legal and financial work in connection with bond issues and financial matters. When the Canadian Northern system was taken over by the Government in 1918, Mr. Ormsby was appointed Secretary and on the consolidation becoming effective at the beginning of 1923, he was made Secretary of the consolidated Canadian National Railway system.

Mr. R. P. Ormsby,

Secretary of the Canadian National Railway and allied companies, 1923-1935

Mr. W. H. Hobbs, who was born in England in 1891 and educated here, began his railway career in London with the South Eastern Railway. He joined the staff of the Financial Vice-President of the Grand Trunk Railway in Montreal in 1913 and was shortly afterwards transferred to the President's office occupying the position of Secretary to the President under Messrs. Edson J. Chamberlin, Howard G. Kelley, and W. D. Robb. He acted as Assistant Secretary of the Grand Trunk Railway Company in 1915-22 during Sir Joseph Flavell's chairmanship and on the formation of the consolidated Canadian National Railway system in 1923 was appointed Secretary to the Chairman and President, Sir Henry Thornton, which position he held until his appointment as Assistant Secretary of the company in 1932.

Mr. W. H. Hobbs,

Appointed Secretary of the Canadian National Railway Company

CANADIAN NATIONAL EARNINGS.—For the month of July, 1935, gross earnings of the Canadian National Railways amounted to $14,886,392, an increase of $893,117 in comparison with July, 1934. Operating expenses ($13,765,011) at the same time advanced by $460,181, leaving net earnings $432,936 higher, at $1,121,381. Aggregate gross earnings from January 1 to July 31, 1935, were $95,029,714, an improvement of $1,539,692, but the aggregate net earnings of $3,300,445 showed a decrease of $1,766,540.

CANADIAN PACIFIC EARNINGS.—Gross earnings of the Canadian Pacific Railway for the month of July, 1935, amounted to $11,130,000, an increase of $413,000 in comparison with July, 1934. In the working expenses of $9,604,000 there was an increase of $398,000, leaving net earnings $15,000 higher, at $1,526,000. For the seven months to July 31, 1935, gross earnings were $67,659,000, a decrease of $269,000, and net earnings $7,588,000, a decrease of $1,978,000 on the first seven months of 1934.

The G.W.R. Centenary Celebrations

Last weekend the centenary celebrations arranged by the Great Western Railway Company to mark the one hundredth anniversary of its incorporation were carried out not only with enthusiasm but also in the flawless manner which results from careful preparation. As briefly announced last week, the first public event was a broadcast on Friday last, the eve of the actual birthday.

The Broadcast

This radio broadcast, which was arranged in conjunction with the B.B.C., was relayed in the National programme between 8 and 9 p.m. and took the form of a journey from Paddington to Penzance, via Bristol, with some interesting detours through the Severn tunnel, to the West Wales coast, &c. A number of G.W.R. officials and employees took part in the programme, which gave listeners a vivid impression of the foundation, growth, and history of the railway. Brief talks by engine drivers, ticket collectors, lost property officials, signalmen, and other employees, who spoke in their own dialects, were interspersed with the noises made by the whistling of engines and shunting of trains. A particularly interesting feature was an argument between drivers of the Cheltenham Flyer and the Cornish Riviera Limited as to the respective merits of their locomotives.

The Lunch at Bristol

To commemorate the association of the City of Bristol with the incorporation of the G.W.R., a luncheon was held on Saturday last (the actual centenary day), in the Great Hall of Bristol University which over 350 guests attended. The party from London left platform 5 at Paddington station in a special train at 10 o'clock headed by the locomotive No. 6000 *King George V* in charge of Driver V. Sparrow, who had broadcast on the previous evening. As far as Swindon the track was lined with spectators, and at Swindon works the whole staff seemed to have assembled to give the train a cheer—in fact, every gantry was crowned by its adventurous youth. Bristol was reached at noon exactly, as scheduled, and motor buses conveyed the party from Temple Meads station to Bristol University, where luncheon was served in the Great Hall.

The Lord Mayor's Speech

Sir Robert Horne, Chairman of the G.W.R., took the chair at the luncheon, and was supported by other directors and chief officers of the company. The guests included the Lord Mayor of Bristol; the Rt. Hon. J. H. Thomas, Secretary of State for Dominion Affairs; the Marquess of Bath, Lord Lieutenant of Somerset; Members of Parliament for Bristol constituencies; Members of the City Council and Society of Merchant Venturers, the two bodies which played a prominent part in the promotion of the company; other civic dignitaries and representatives of the commercial and industrial interests of Bristol and District; and also descendants of those who were engaged in the formation of the company.

The Lord Mayor of Bristol, Alderman H. J. Maggs, proposed the toast of "The Great Western Railway Company." After congratulating all concerned on the success of the previous day's broadcast, he said that the citizens of Bristol regarded it as a great compliment that he, as Lord Mayor, should have the honour on that memorable occasion of proposing that important toast. As the old minute books for the year 1833 showed, it was "at a numerous and respectable meeting of inhabitants of Bristol desirous of assisting in the establishment of a railway to London, held at the Guildhall, Bristol, on July 30, 1833, and presided over by Robert Bright," that this great scheme was initiated. He hoped the present party might still be described as respectable, and, thanks to the generosity of the Great Western Railway Company, it was certainly numerous.

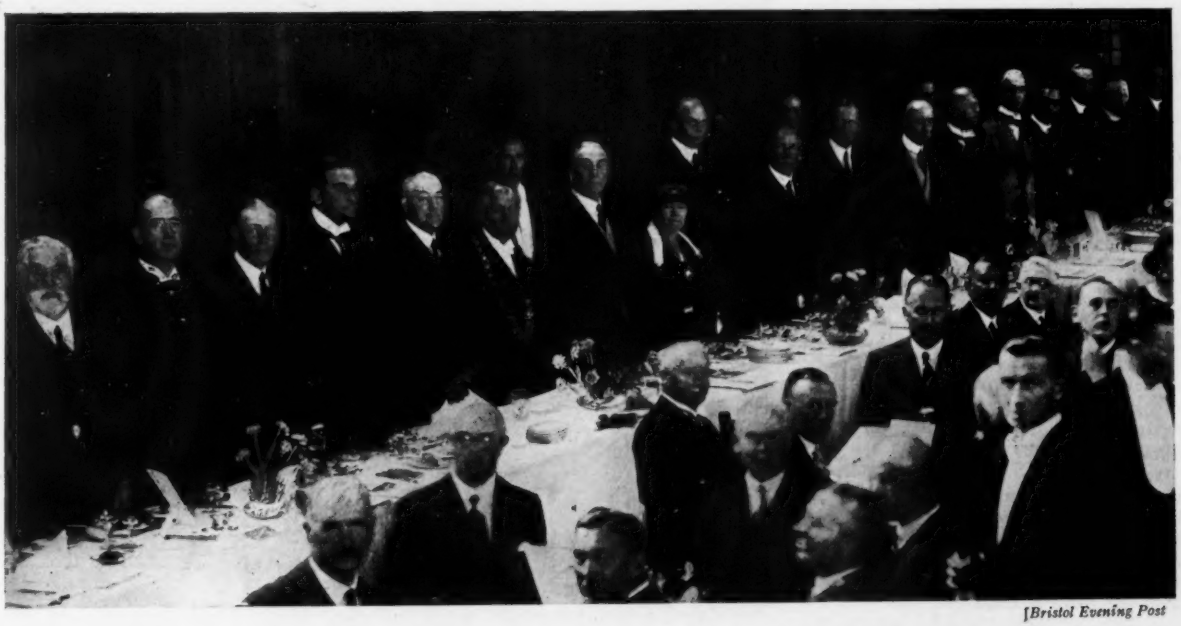
The association of Bristol with the G.W.R. had, he said, established some records of the greatest importance to the railway company and to the city. He instanced the following:—

Temple Meads, Bristol, was now the busiest traffic centre on the G.W.R. Each year 5,000,000 passengers used its platforms and a further 10,000,000 passengers passed through the station.

Well over 4,000,000 parcels were handled each year at Temple Meads station, the outgoing being 40 per cent. in excess of the inflow—due to Bristol manufacturing practically every commodity in ordinary use—a feature of which Bristolians were extremely proud.

The first goods depot erected at Temple Meads in 1840 catered for 209 wagons. The present depot, completed in 1929, was equipped with every modern appliance and was the largest in the Kingdom.

The citizens of Bristol were extremely pleased and proud of the company's great achievements in their midst. The growth and prosperity of that city and of the company had been closely



[*Bristol Evening Post*

The Chairman and a group at the G.W.R. centenary luncheon at Bristol on Saturday last

XUM

The special train approaching Badminton on its run from London to Bristol headed by locomotive No. 6000 "King George V." The bell presented to the engine at Baltimore is clearly seen

Photo] [W. Vaughan Jenkins

linked during the past hundred years. The G.W.R. was the first railway company to celebrate its centenary. Its history and greatness during the hundred years was of outstanding national importance. "May the company continue to prosper, and may the happy relations between the city and the company grow even stronger as the years go by."

In conclusion he would repeat the words used by Robert Bright, their esteemed fellow citizen of 100 years ago, the chairman of that momentous meeting on July 30, 1833, when the great railway undertaking was first launched. He was acknowledging the vote which had been passed expressing thanks for his kindness in taking the chair and used these words: "At this, the head spring of the undertaking, facilities must be given, impediments must be removed, charges must be lowered. I allude to this, not in hope, but in unbounded and implicit confidence; by the liberality of our public bodies, our undertaking has been brought to birth, and they will not desert it when required to give it power at its maturity." Bright and his colleagues, the Lord Mayor added, were men of courage and vision, and their unbounded confidence had been fully justified and realised.

Sir Robert Horne's Speech

Sir Robert Horne, in replying to the toast, thanked the Lord Mayor for allowing the G.W.R. to hold its centenary banquet in that hall, and recalled that a representative of the Wills family—which was responsible for the building of Bristol University—had for many years occupied a seat on the board of the G.W.R. Continuing, Sir Robert said:—

"The occasion which brings us together here is one which is worthy to stir the memory and to inspire the imagination. The centenary of one of our great railways, whose span of life is practically coterminous with the invention and development of railway transport in this country, inevitably sets agoing in our minds a certain train of reflections. Who is there amongst us at this moment that can help thinking of the revolution which was caused in commercial and industrial life by the adoption, one hundred years ago, of this new mode of conveyance, and who is there who can forget the vast changes which it has brought about in the conduct of human affairs throughout the civilised world? It is indeed no casual or random or haphazard episode that we are celebrating here today, but an event which takes its essential place in a movement of historical significance and of world-wide importance.

"There are some who deprecate the holding of centenaries, but although today may be but the continuation of yesterday and the flow of time an unbroken stream, yet there are definite and significant periods when we reach a fuller realisation of events—when we seem to halt for a space and look both forward and back; when we reflect upon the past and take account of the future; and when a just pride in a record of long and honourable achievement may afford a heartening encouragement to new energy and a powerful stimulus to achievement. Such points of time are charged with vital elements of new strength and provide the driving power of the years to come. It is in this attitude of mind and spirit that we find ourselves today in Bristol, cheerfully conscious of a hundred years of strenuous effort and substantial accomplishment behind us, and deriving fresh inspiration from a community of people whose far-seeing forbears initiated our railway, which was to become the source of a mighty river of traffic, fed by a multitude of tributaries.

"Bristol was in truth the *fons et origo* of the Great Western Railway. Can I say anything more complimentary than is what sometimes hopefully said of a bride and bridegroom, that Bristol and the Great Western Railway are worthy of each other. A hundred

Sir Robert Horne, Chairman of the G.W.R., and the Rt. Hon. J. H. Thomas, Secretary of State for the Dominions, with Driver V. Sparrow on the footplate of the "King George V" on Saturday last

years ago Bristol was already one of the most important centres of business in the United Kingdom. She had an enterprising population and carried on many important industries. From her crowded havens, her seafaring men, like the Venetians of old, sailed into all the known seas. Nor was this eminent position a thing of recent or sudden acquisition. She was the first town outside of London to receive the status of a County—and that was as early as the days of Edward the Third. It was from Bristol that John Cabot sailed in 1497 to anticipate Christopher Columbus in the discovery of America. From the earliest times and onwards, Bristol has been a city of enterprise and activity as well as of character and dignity. When we think of Bristol, we of the Great Western Railway Company are proud of our origin.

An Incident in "Abyssinia"

"And Bristol is nothing if not up-to-date: perhaps even well ahead of the times, as the following authentic narrative will prove. About the middle of last century an accident took place in one of the sidings in Bristol station. An enquiry was held from which it emerged that the men in the station were accustomed to call this particular siding Abyssinia. A question as to the reason of this exotic nomenclature elicited the reply from one of the engine drivers: 'Well, that siding's very difficult to get into, but God knows, it's a damned sight harder to get out of.'

"Reverting, however, to earlier times it was, as you know, in 1833 that a company of Bristol men assembled to start the project of a railway between Bristol and London. The result was that 100 years ago today the Royal assent was given to the Act which formed the G.W.R. Bristol had been oppressed by the precarious character of sea communications during the Napoleonic wars, and was also anxious to decrease the cost of carriage between the Metropolis and its own trading community. The possibilities of rail transport were already being actively canvassed and some lines of railway were already in existence in the North. Brunel, the resourceful engineer and man of genius, whose constructive work remains today a notable example of inspired engineering and artistic design, was appointed to survey the route. The Bill, which provided only for a line from Bristol to Bath and another from London to Reading, was rejected by a Committee of the House of Lords in 1834, but its undaunted sponsors promoted a fresh Bill in the following session for a complete line between Bristol and London.

The "Great Western" Steamship

"There is an episode in the history of the Great Western Railway Company which is comparatively little known and connects it more intimately and romantically with Bristol than with any other part of the system. It is an adventure in the true tradition of Bristol and of John Cabot. Immediately after the incorporation of the company, the committee as a board of directors met at Bristol. In the course of discussion some mention was made of the length of the line, when Brunel cut in with the remark 'Why not extend the line and build a steamship to ply between Bristol and New York.' Remember that this was the year 1835 and that it was the tumultuous seas of the Atlantic Ocean that were to be navigated. You will be able, thus, to estimate the character and quality and spirit of those Bristol men from their reaction to this proposal. Guppy, one of the stoutest of the original Bristol directors, seized upon the idea. He took three of his fellow-directors the same night to see Brunel at his hotel to discuss the working out of the proposal. By January, 1836, a prospectus had been issued for the purpose of setting up a company called the Great Western Steamship Company with a capital of £250,000. It was promoted almost entirely by directors of the Great Western Railway Company, and its purpose was to create a line of steamships to ply between Bristol and New York. Undismayed and undeterred, by vaticinations of evil from seafaring and scientific men alike, these adventurers pursued their purpose.

"The Soul of John Brown"

"Brunel designed the ship. This versatile genius was as ready to design a ship as a railway. It was built of wood and had side paddles; she was launched from a Bristol yard in July, 1837; was sent round to the Thames to be fitted with her engines and left Bristol on her first voyage in April, 1838. Seven resolute passengers sailed in her and she accomplished her voyage in fifteen days. One hundred thousand spectators lined America's shores to see her begin her return journey, which she performed with equal success. After this maiden voyage the *Great Western* made over sixty voyages carrying on an average between 80 and 90 passengers. She was the first steamship in the world that regularly supplied a service in the Atlantic Ocean. Eventually the company which operated her was dissolved and the *Great Western* was broken up, but, as in the lyrical case of John Brown, her 'soul went marching on,' for the Cunard Company, which was formed soon afterwards, built four vessels of the same design as the *Great Western* and similarly engined, with which they began the famous service which has continued without interruption until this day. May we not claim on behalf of the G.W.R. that we were the pioneers of the Atlantic steamship traffic and take a personal pride in the latest Cunarder, the *Queen Mary*, as the lineal descendant of the *Great Western? Queen Mary* is the soul of 'John Brown' that keeps marching along!

"The changes which have taken place in connection with the Great Western Railway during this fateful century are necessarily many and various. It has grown by a process of natural extensions within its own area. Numerous smaller railway systems have been absorbed into its organisation; others have been merged with us by Act of Parliament. A surfeit of docks has been similarly forced upon us till we are now one of the largest dock-owners in the world. But in the midst of all the changes of fate and fortune the Great Western has never lost either its individuality or its character, and it stands today for a precious tradition with which it is honourably identified in the minds of all who live and travel 'Great Western.' A friend of mine, who writes me a letter of congratulation this morning, Lord Greenwood, put this idea in his charming way and gives it a wider vogue when he says: 'All England seems to have a friendly family feeling for the Great Western.' In the course of its hundred years of life the company has had its high and prosperous times; but at not infrequent intervals in its history it has gone through spasms of acute anxiety. It has had good and ill-fortune; dark days and bright; disappointment alternating with success. But at every stage of its existence in the past, whatever was the problem to be solved or the trouble to be surmounted, there were never lacking in its service those with the courage to conquer and the wisdom to find the way. It has throughout been fortunate in the ability of those who have managed its affairs and in the loyalty of the vast number of men who have served it. One of the promoters in giving evidence for the original Bill stated that their object was not to embark upon a speculation but to create a great public service. That object—I think we may confidently assert—the company has achieved And upon an occasion like the present when a certain draft upon sentiment is permissible, I may venture to claim, as our proudest possession, that during the process of the years there has been evoked and established in relation to this company something which we dearly cherish and would jealously guard, in the warm-hearted loyalty of the people of the Western communities whom it is our pride, our privilege, and our good fortune to serve."

The Bristolian

Sir Robert then proposed the toast of "The Guests," and in so doing he said that the G.W.R. desired to see as many Bristol people in London (and *vice versa*) as possible! To assist them he had pleasure in announcing that, to commemorate Bristol's association with the company, it was proposed to introduce a new express in each direction between Paddington and Bristol as from Monday, September 9. The train would be called The Bristolian and would be scheduled to do the 118¼ miles on the down journey via Bath and the 117¼ miles on the up journey via Badminton in 105 minutes in each

direction at an average speed of 67·6 m.p.h. and 67·1 m.p.h. respectively. The ordinary running schedule would involve speeds of something like 80 m.p.h. for the greater part of the journey. The new train would leave Paddington at 10.0 a.m. and Bristol at 4.30 p.m. on Mondays to Fridays inclusive, and would be the fastest in the country for a run of over a hundred miles.

[Further reference to these new trains is made later in this article.—ED. *R.G.*]

Mr. J. H. Thomas replied for the guests in characteristic style. At the outset he said he accepted the lunch as an apology for the sweated conditions in which the G.W.R. first employed him at 7s. a week. He recalled the days before trade unions were recognised and the fights to secure workmen's fares and cheaper facilities. Now there was no company that more frankly recognised trade unionism than the G.W.R. In conclusion he asked: What other country was there today which could have an assembly like that celebration, at which a great commercial and capitalist institution invited as its guests all classes and creeds, and at which the representative of His Majesty's Government, replying for the guests, was a man who was once the engine cleaner, the engine fireman, and the engine driver of that railway. In a day of dictatorships, when democracy existed practically only in this country, they should not underrate the significance of that great centenary. He had lived a full life and played many parts, and this had taught him that it was wrong to indict any class or creed. Men and women were there who should join with him in saying that we stood out as a beacon light to the rest of the world.

Telegrams of congratulation were received at the lunch from Major-General W. P. H. Hill, Command Headquarters, Salisbury; Sir Donald Banks, General Post Office; the President and Council of the Institution of Mechanical Engineers; Mr. C. P. Fullerton, Chairman of the Canadian National Railways; Dr. Burgin, M.P., Parliamentary Secretary to the Board of Trade; and from a visitor at the Crown Hotel, Slough, the first booking office of the G.W.R.

A handsome 24-page souvenir of the early association of the G.W.R. with Bristol was presented to each guest, and the Lord Mayor paid no more than just tribute to its merits when, in the course of his speech, he referred to "the beautiful souvenir prepared with such excellent taste by your Secretary, Mr. F. R. E. Davis."

The Centenary Film

After the lunch the guests were given an exhibition of the G.W.R. centenary sound film which comprises interesting flashes of important landmarks in the company's history—early construction scenes with Brunel and Gooch; Gooch, when older, and the company's Chairman, fighting financial difficulties; and modern topographical shots and workshop scenes at Swindon. This film, entitled "The Romance of a Railway," was screened specially in the West End of London for the one day only at the Curzon Cinema, Curzon Street, on Saturday last.

The return train to London left Temple Meads at 4.30 p.m. and arrived at Paddington at 6.15, thus running to the new schedule prepared for The Bristolian. On arrival at Paddington, where a large crowd had assembled, Sir Robert Horne and Mr. J. H. Thomas shook hands warmly with Mr. Sheldon, the chief locomotive inspector; Mr. V. Sparrow, the driver; and Mr. R. Sims, the fireman.

Paddington-Bristol in 1¾ Hours

Some new standards of high speed long distance travel in Great Britain are set up by the Bristolian service of the Great Western Railway, which, as announced by Sir Robert Horne, the Chairman of the company, at the centenary luncheon in Bristol University on Saturday last, will begin running on Monday next. The down Bristolian, leaving Paddington at 10 a.m., will be due in Temple Meads, Bristol, at 11.45 a.m., and the corresponding up express, leaving Bristol at 4.30 p.m., will reach Paddington at 6.15 p.m. This time of 105 min. represents a cut of 15 min. on the best time of 120 min. now in force. The latter has since 1903 been the shortest journey time between London and Bristol, save for a short period during 1932 and 1933, when the

SCHEDULE OF UP BRISTOLIAN EXPRESS

Distance	—	Schd.	From point to point		
			Distance	Time	Av. speed
miles		p.m.	miles	min.	m.p.h.
0·0	Bristol dep.	4.30	—	—	—
4·8	Filton Junction* pass	4.39½	4·8	9½	30·3
17·6	Badminton ,,	4.53	12·8	13½	56·9
34·7	Wootton Bassett* ,,	5.07	17·1	14	73·3
40·3	Swindon ,,	5.13	5·6	6	56·0
61·1	Steventon ,,	5.29	20·8	16	78·0
64·5	Didcot ,,	5.31½	3·5	2½	81·6
81·6	Reading ,,	5.44½	17·1	13	78·9
93·4	Maidenhead ,,	5.53½	11·8	9	78·7
99·1	Slough ,,	5.57½	5·7	4	85·5
108·5	Southall ,,	6.04½	9·4	7	80·6
117·6	Paddington arr.	6.15	9·1	10½	52·0

* Service slack

SCHEDULE OF DOWN BRISTOLIAN EXPRESS

Distance	—	Schd.	From point to point		
			Distance	Time	Av. speed
miles		a.m.	miles	min.	m.p.h.
0·0	Paddington dep.	10.00	—	—	—
9·1	Southall pass	10.11	9·1	11	49·6
18·5	Slough ,,	10.19	9·4	8	70·5
36·0	Reading ,,	10.33	17·5	14	75·0
53·1	Didcot ,,	10.46½	17·1	13½	76·0
56·5	Steventon ,,	10.49½	3·4	3	68·0
77·3	Swindon ,,	11.06½	20·8	17	73·4
94·0	Chippenham ,,	11.20	16·7	13½	74·2
106·9	Bath* ,,	11.31½	12·9	11½	67·3
118·3	Bristol arr.	11.45	11·4	13½	50·7

* Service slack

11.15 a.m. down two-hour express was accelerated to a run of 118 min., and the 1.15 p.m. down to 116 min. Since then the Bath slip on both these trains has been replaced by a stop of 3 min. duration, which (in view of the speed reduction necessary in any event over the curve through Bath) is equivalent to making the London-Bristol run in a net non-stop time of 115 min. The new 105 min. schedule cuts 10 min. below this.

On the down journey the Bristolian will travel via Bath, and the 105-min. timing involves a start-to-stop average of 67·6 m.p.h. over the 118·3 miles of this route. From Paddington to Swindon the engines are faced with gradients which, though slight, are chiefly adverse, and a particularly notable feature of the down journey schedule is the average speed of 73·4 m.p.h. demanded from Steventon to Swindon, where the rise—here chiefly at 1 in 754 and 1 in 834—is the most pronounced. Over the 68·2 miles from Southall to Swindon the booked average speed will be 73·7 m.p.h. Bath, 106·9 miles from Paddington, is to be passed in 91½ min., and the timing is eased between Chippenham and Bristol to permit of the observance of Bath service slack.

On the up journey, which is to be made via Badminton, the distance of 117·6 miles calls for a start-to-stop average of 67·2 m.p.h. The start of the run is very difficult, including as it does an ascent of 2¼ miles at 1 in 75 from Stapleton Road past Ashley Hill, an easing over the curve from Filton Junction to Stoke Gifford, and then an eleven-mile climb at 1 in 300 to Badminton, which explains the apparently liberal allowance of 23 min. for the first 17·6 miles. But from Badminton to Paddington the gradients are almost exclusively in favour of the engine, and the only hindrance to sustained speed is the 45-m.p.h. service slack at Wootton Bassett. The distance of 100 miles from Badminton to London is therefore allowed 82 min. only, and a pass-to-stop average speed of 73 m.p.h. is thus required. From Swindon to Paddington, 62 min. for 77·3 miles, although 3 min. less than the 65 min. timing of the Cheltenham Flyer, corresponds almost exactly with the Flyer's schedule, as the 3 min. saved represents the difference between passing Swindon at full speed, and accelerating from a dead start. Over the 68·2 miles from Swindon to Southall the up Bristolian will be booked to travel at the remarkable average speed of 79·5 m.p.h. throughout; the average over the 90·8 miles from Badminton to Southall, including the slack at Wootton Bassett, will be 76·2 m.p.h. The day-to-day performance of the locomotives on these new and enterprising schedules should prove both interesting and informative.

Trial runs on the 105-min. bookings were made on August 15, with the 4-cyl. 4-6-0 locomotive No. 6000, *King George V*, and a load of seven coaches, which included on the rear the white-

wash coach of the Engineer's Department for oscillation-recording purposes. The times in both directions were maintained without difficulty, and with about a minute to spare. The first public demonstration of the schedule took place on Saturday last, when the guests at the centenary luncheon were brought back to London in the times of the new 4.30 p.m. express. A train of seven vehicles, including four saloons of the latest type, two observation saloons, and a kitchen car, had been made up, of which the tare weight was 251 tons, and the gross weight, with passengers and luggage, 265 tons; the engine, *King George V* (Driver Sparrow, of Old Oak Common shed) was again employed. No attempt was made at the record-breaking which various newspapers had so freely forecast. Actually the running from Swindon to Paddington, which was the most interesting part of the journey, corresponded closely with the normal standard of running daily achieved by "Castle" class locomotives on the Cheltenham Flyer; the maximum speed attained was 88 m.p.h. at Acton. A slight excess of 29 sec. over the 105 min. schedule is explained by the exceptional caution with which the driver drew up at the arrival platform at Paddington. The times and speeds on this journey were recorded jointly by Mr. Cecil J. Allen and Mr. Humphrey Baker, and are set out in detail in the annexed table. They show that the new timings present no difficulty from the locomotive point of view. It remains only to add that the riding of the rear coach, in which the recorders travelled, was unexceptionably smooth throughout the journey.

G.W.R. Centenary Special: Bristol–Paddington
Engine: 4-cyl. 4-6-0 No. 6000, *King George V.*
Load: 6 saloons and kitchen car; 251 tons tare, 265 tons full

Distance	—	Schd.	Actual	Speeds
miles		min.	min. sec.	m.p.h.
0·0	BRISTOL (TEMPLE MEADS)	0	0 00	—
1·6	Stapleton Road ..	—	4 35	42
4·8	Filton Junction ..	9½	9 43	32*
6·1	*Stoke Gifford East* ..	11½	11 55	—
9·1	Coalpit Heath ..	—	15 35	55½
13·0	Chipping Sodbury ..	—	19 42	62½
17·6	Badminton	23	24 09	63
23·4	Hullavington ..	—	29 02	75
27·9	Little Somerford ..	—	32 33	80½
34·7	Wootton Bassett ..	37	38 44	50*
40·3	SWINDON	43	43 52	75
46·0	Shrivenham	—	48 27	—
51·1	Uffington	—	51 29	77
57·2	Wantage Road ..	—	57 15	77½
61·1	Steventon	59	60 18	77½
64·5	DIDCOT	61½	62 53	79
69·1	Cholsey	—	66 29	—
72·9	Goring	—	69 20	—
76·1	Pangbourne	—	71 48	80
81·6	READING	74½	75 55	81½
86·6	Twyford	—	79 40	77
93·4	Maidenhead	83½	84 37	86½
99·1	SLOUGH	87½	88 58	77½
104·4	West Drayton ..	—	92 53	81½
108·5	SOUTHALL ..	94½	95 56	82
111·9	Ealing Broadway ..	—	98 18	86½
113·3	Acton	—	99 20	88
116·3	Westbourne Park ..	—	102 18	—
117·6	PADDINGTON ..	105	105 29	—

* Speed restriction

Waterloo Telephone.—From October 1 the telephone number of the Southern Railway at Waterloo will be Waterloo 5100.

L.N.E.R. Mikado Performance

On the heavy express duties over the Edinburgh-Aberdeen route, Mr. Gresley's 2-8-2 locomotives Nos. 2001 and 2002, *Cock o' the North* and *Earl Marischal* respectively, are putting up fine performances. Details of the engine working on some recent runs show that even the hardest uphill work is being performed on relatively early cut-offs. On the 10.20 a.m. up express from Aberdeen, loaded to 479 tons tare and 515 tons gross, No. 2002 was linked up to 25 per cent. cut-off one mile from the start, and yet passed the summit at mile post 234, 7·1 miles, in 13¼ minutes; speed did not fall below 35½ m.p.h. on the 1 in 102 through Cove Bay and rose to 41½ in the subsequent 1½ miles at 1 in 164-153 to the summit. Up the 1 in 85-92 out of Stonehaven, 32 per cent. was used, but perhaps the most remarkable feat occurred in starting from Montrose. Up the 1 in 88½ grade, which extends for 2 miles from the start, cut-off was reduced to 32 per cent. after half a mile and speed rose to 29 m.p.h. on the grade. On all these ascents full regulator was used, and with this opening there was no drop whatever in pressure between the boiler and steam chest—a striking tribute to the design of the steam passages. The uphill work was such that no speed in excess of 66 m.p.h. was needed on the down grades, and this the engine attained on 18 per cent. cut-off with the regulator closed to such a degree as to give only 80 lb. per sq. in. pressure in the steam chest. When running under such easy steaming conditions as this, the extra deflecting screens were most effective in throwing the exhaust clear of the cab. The engine steamed with consistent freedom.

The performance of No. 2001 on the up Aberdonian from Dundee to Edinburgh was equally good. With a load of 493 tons tare, 530 tons gross, no more than 18 per cent. cut-off was used for 53 out of the 59·2 miles. On the initial 0·6 mile at 1 in 66-74 to Dundee Esplanade station, cut-off was reduced from a momentary 65 per cent. on starting to 35, meanwhile the speed had risen in this short distance to 19½ m.p.h. Falkland Road bank, 3½ miles at 1 in 111-95-105, was taken on 18 per cent., speed falling from 60 to 25½ m.p.h., while the coasting ability of the engine was exploited to the full on the descent through Kirkcaldy. Here steam was shut off on attaining 55 m.p.h., and the subsequent 5·3 miles from Dysart to Kinghorn were run at an average speed of 59·3 m.p.h. with the engine running in mid-gear, and despite the fact that speed was carefully reduced to 25 m.p.h. through Kinghorn. Up the 2 mile ascent at 1 in 70 on to the Forth Bridge, which succeeds the 25 m.p.h. slack through Inverkeithing, 25 per cent. cut-off was used until within half a mile of the summit, when an advance to 35 per cent. was made. Here, speed fell only from 24 to 19 m.p.h. On this engine, with the regulator handle at a position on the quadrant indicating about three-quarters open, full boiler pressure was obtained in the steam chest; this position was used for all the heavy work. On every trip recorded, both this engine and No. 2002 had a little in hand on schedule times at all intermediate points in the journeys.

Lectures in Railway and Cognate Subjects

The syllabus of lectures in railway and cognate subjects to be provided for students in transport at the London School of Economics during the coming university year has now been published. The Michaelmas term begins on October 7. Details of the lectures are given below, and the letters "M," "L," and "S" (standing for Michaelmas, Lent, and Summer) in brackets denote the terms in which they will be given.

Railway Geography, Dr. Dudley Stamp (M.L.).
Law of Carriage by Rail, W. V. Ball, O.B.E., M.A., and J. Turner, LL.M. (M.L.).
Commercial Railway Economics, W. T. Stephenson, M.A. (M.L.).
General Statistics, E. C. Rhodes, B.A., D.Sc. (M.L.).
General Economics of Transport, G. J. Ponsonby, M.A. (M.).
Business Administration, Prof. A. Plant, B.Sc., B.Com. (M.L.).
Accounting (Parts I and II), S. W. Rowland, LL.B., F.C.A. (M.L.S.).
Operating Railway Economics, W. T. Stephenson, M.A. (M.L.).
Economics of Road Transport, G. J. Ponsonby, M.A. (M.L.).
Railway Statistics, G. J. Ponsonby, M.A. (L.).
Railway Accounts, S. W. Rowland, LL.B. F.C.A. (L.).
The Economic Consequences of Recent Transport Legislation, G. J. Ponsonby, M.A. (L.).
Elements of Transport, W. T. Stephenson, M.A. (M.L.).
Economics of Transport, W. T. Stephenson, M.A. (M.L.S.).

Any further information may be obtained on application to the Secretary of the School, Houghton Street, Aldwych, W.C.2.

Special classes in transport are also provided by a special department of the City of Birmingham Commercial College. These are planned to give suitable preparation for the examinations of the Institute of Transport and other similar examining bodies. Full particulars may be obtained on application to the principal, Mr. W. Henderson Pringle, M.A., LL.B., City of Birmingham Commercial College, Suffolk Street, Birmingham, 1. The Michaelmas term commences on September 23.

L.M.S.R. Staff Golf Competition.—Twenty-four finalists will compete tomorrow at the Hillside Golf Club, Southport, for the "L. F. Rowlandson" Challenge Cup, which is open to L.M.S.R. staff of all grades. The first pair drive off at 10 a.m.

XUM

NOTES AND NEWS

Irish Main-Line Stock.—Additional to the ten carriages described in THE RAILWAY GAZETTE for July 19, the Great Northern Railway (Ireland) has just authorised the construction at its Dundalk works of four semi-steel bogie third class vestibuled carriages.

Bulgarian Electrification.—It is reported that the Bulgarian Government has approved the State Railways plans for the electrification of the railways from Sofia to Pernik and Mesdras. The work will be put in hand as soon as satisfactory financial arrangements can be made.

Polish Exhibition Train.—To advertise the agricultural and industrial products of Poland a train of 30 vehicles is now touring the main Polish towns with exhibits covering a large selection of goods. In addition to the exhibition cars, the train includes a cinema van, a travelling power station, and steel restaurant and sleeping cars for the staff.

Road Accidents.—The Ministry of Transport return for the week ended August 31, 1935, of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding period of last year :—

	Killed, including deaths resulting from previous accidents	Injured
England ...	... 118 (129)	4,194 (4,963)
Wales ...	... 1 (8)	236 (272)
Scotland ...	... 5 (5)	376 (460)
	124 (142)	4,806 (5,695)

The total fatalities for the previous week were 130, as compared with 159 for the corresponding period of last year.

Bombay Electrification.—The conversion work on the B.B.C.I.R. Borivli-Virar section (the official approval of which scheme was noted in our *Electric Railway Traction Supplement* for March 8) has now been put in hand. This line is a 16-mile extension of the present 1,500-volt d.c. suburban system, and the cost of electrification has been estimated at Rs. 25.68 lakhs.

Railway Concessions for Tourists who Fly to Germany.—From September 1 foreign travellers in Germany will be conceded a 60 per cent. reduction in railway fares to and from airport stations within the Reich. Previously this reduction was accorded only to those who booked their tickets abroad or in the tourist bureau on board a German ship. This concession will operate until October 31, after which date a 25 per cent. reduction will be available under the same conditions until December 31.

Grain by Road Transport.—At a sitting of the East Midland Licensing Authority at Lincoln on September 3, Mr. S. L. Green, of Faldingworth, asked for an additional two vehicles of 6 tons unladen weight for long-distance grain haulage. He was granted half the additional tonnage asked. It was stated on behalf of the L.N.E.R., which opposed the licence, that in North and East Lincolnshire the company had lost 75 per cent. of its grain traffic since the coming of road transport.

Polish Cut-off Line.—A new double-track direct line is being built from Sierpce to Torun, a distance of 50 miles, in order to give better communication between Warsaw and the towns on the lower Vistula. The new line will reduce the distance between the capital and Torun by 25 miles.

Another 100 m.p.h.—It is stated that in the course of trials with one of the new E.18 class of electric locomotives belonging to the German State Railway, a speed of 165 km.p.h. (102·5 m.p.h.) was reached on the level. These locomotives have an hourly rating of 4,230 h.p. and a quarter-hourly output of 4,800 h.p.

More Overseas Visitors to Britain.—The Travel and Industrial Association of Great Britain and Ireland announces that there were 8,105 more visitors to this country from overseas in July last than during the corresponding period of 1934. The largest numbers came from the United States and France, the numbers being 16,891 and 13,647 respectively, increases of 3,358 and 2,010.

New Station for Gatwick Airport.—The Southern Railway announces that a new station, to be known as Tinsley Green (for Gatwick Airport), will be opened for general passenger traffic as from September 30. Twenty-seven down trains, from Victoria and London Bridge, will call from Mondays to Fridays, and 28 on Saturdays. From Three Bridges and Brighton the station will be served by 36 trains daily. The average journey times from London will be between 51 and 55 minutes.

High-Speed Train Derailed. The *City of Portland*, the 1,200 b.h.p. seven-car articulated diesel-electric train of the Union Pacific, was derailed recently when running at speed through Nugget Canyon, Wyoming, on the journey from Chicago to Portland. Four cars were derailed, and the train ran over three-quarters of a mile before it was stopped. It crashed through a water pump and a tool shed, but no vehicle turned over, and only minor injuries occurred among the 75 passengers. A broken tyre is stated to have been the cause of the accident.

Taper-Boilered "Royal Scot."—A new express locomotive, No. 6170, to be built this autumn at Crewe, will be named *The British Legion*. This engine will be of the "Royal Scot" class, but will have a tapered domeless boiler instead of the cylindrical type used on the 70 existing engines of this class, most of which are named after famous British regiments. *The British Legion* will be the first engine of the "Royal Scot" class to be built at Crewe, the first 50 having been constructed by the North British Locomotive Co. Ltd. and the next 20 at the L.M.S. works at Derby.

Swedish Conversion.—The 97-mile Krylbo-Bollnas section of the northern main line has been converted to electric traction, and steam trains will cease to run during the course of the present month. This line forms an extension of the Stockholm-Upsala-Krylbo division, which was opened to electric traction in January last.

Travel Exhibition in Lucerne.—The Skal Club of Lucerne is organising the first Swiss travel exhibition in that city from September 21 to October 5 next. The Swiss Federal Railways and the Swiss Federal Post Department are collaborating with the National Tourist Office and the Swiss Hotel Keepers Association in helping the enterprise.

Timken Holdings.—Timken Holdings was registered on August 31 as a private company, with a nominal capital of £125 in 1,250 A and 1,250 B shares of 1s. each, to carry on the business of an investment and trust company, and to enter into an agreement with Mr. Michael B. U. Dewar for the acquisition of shares in British Timken Limited.

Accident on Miniature Railway.—A lorry came into collision at a level crossing near Dymchurch station last Monday with a train on the 15-in. gauge Romney, Hythe & Dymchurch Railway. The locomotive *Northern Chief*, of the Pacific type, was overturned and several of the coaches were derailed. The only casualty was the lorry driver, and he was not seriously injured.

Glyn Valley Tramway.—The company which was incorporated by special Act in 1870 as the Ellesmere & Glyn Valley Railway and subsequently changed its name to the Glyn Valley Tramway has now been re-registered as a limited company. The registered office is at 5, High Street, Ruabon. The narrow-gauge line (2 ft. 4½ in.) extends from Chirk to Glyn Ceiriog. It was opened with horse traction in 1873 and steam locomotives were introduced in 1888. The passenger service was withdrawn on April 6, 1933, and the line was closed to all traffic on July 6 last.

Postal Traffic on the Reichsbahn.—The efficiency of the German State Railway and Postal Department is shown by the figures published by the latter concerning the mails dealt with by rail. In Berlin alone, from January to March, 1935, 363 daily car loads of mails, out and in, were handled. This puts Berlin by a long way at the head of all German cities, but the others can show quite imposing figures. In Frankfort (Main), in the same period, 240 car loads were handled every day and at Cologne 229. In Central Germany, Leipzig takes the lead with 195 car loads, then comes Hamburg with 144, Stuttgart with 142, Dresden with 120, Munich with 116, Breslau with 111, and Königsberg with 52. The figures for last Christmas are impressive. From October to December, Berlin handled daily 407 railway postal vans, Frankfort (Main) 264, Cologne, 245, and Leipzig 219.

RAILWAY AND OTHER REPORTS

Shahdara (Delhi) — Saharanpur Light Railway.—Gross earnings for the half-year ended March 31, 1935, were Rs. 4,36,880, a decrease of Rs. 1,07,164 or 19·70 per cent. Passenger earnings were down Rs. 23,444, and goods traffic receipts were down Rs. 83,817 due to the cold weather, which completely ruined the sugar cane crop. Expenses, at Rs. 1,89,836, showed an increase of Rs. 1,914 or 8·90 per cent., and the operating ratio rose from 34·55 per cent. to 43·45 per cent. Net earnings amounted to Rs. 2,04,544, a decrease of Rs. 1,09,078. After payments to the Managing Agents, to the Government of the United Provinces, and for debenture interest, &c., there is a net profit of Rs. 51,834 against Rs. 96,505. After adding Rs. 6,63,996 brought forward the directors recommend a dividend for the half-year at the rate of 6 per cent. per annum, tax free, which absorbs Rs. 45,000 and leaves Rs. 6,70,830 to be carried forward.

Rhaetian Railway.—This extensive Swiss private railway, which serves the Graubünden district, shows a rise in receipts for 1934 to fr. 10,460,000, against fr. 10,270,000 in 1933, attributable to increased passenger and livestock traffic, the latter arising from the attempts being made by the Government to develop the export of pedigree animals. The other classes of traffic showed a decline, goods receipts falling from fr. 3,220,000 to fr. 3,180,000. Parcels traffic suffered considerably. Working costs were brought down from fr. 7,460,000 to fr. 7,230,000. Profit on working rose from fr. 420,000 to fr. 3,550,000. Interest on fixed debt again took fr. 3,450,000, and the floating debt called for fr. 165,809, an increase of fr. 24,168. The total loss for the year was fr. 67,000, an improvement over the fr. 1,120,000 of 1933.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 35th Week			Totals to Date		
	1935	1934	Inc. or Dec.	1935	1934	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,925¼ mls.)						
Passenger-train traffic...	598,000	583,000	+ 15,000	17,469,000	17,062,000	+ 407,000
Merchandise, &c. ...	450,000	447,000	+ 3,000	15,433,000	15,368,000	+ 65,000
Coal and coke ...	226,000	233,000	− 7,000	7,859,000	7,868,000	− 9,000
Goods-train traffic ...	676,000	680,000	− 4,000	23,292,000	23,236,000	+ 56,000
Total receipts	1,274,000	1,263,000	+ 11,000	40,761,000	40,298,000	+ 463,000
L.N.E.R. (6,336 mls.)						
Passenger-train traffic...	411,000	401,000	+ 10,000	11,355,000	11,047,000	+ 308,000
Merchandise, &c. ...	328,000	326,000	+ 2,000	10,684,000	10,690,000	− 6,000
Coal and coke ...	227,000	234,000	− 7,000	7,653,000	7,852,000	− 199,000
Goods-train traffic ...	555,000	560,000	− 5,000	18,337,000	18,542,000	− 205,000
Total receipts	966,000	961,000	+ 5,000	29,692,000	29,589,000	+ 103,000
G.W.R. (3,749½ mls.)						
Passenger-train traffic...	274,000	264,000	+ 10,000	7,379,000	7,241,000	+ 138,000
Merchandise, &c. ...	183,000	185,000	− 2,000	6,246,000	6,196,000	+ 50,000
Coal and coke ...	102,000	106,000	− 4,000	3,392,000	3,430,000	− 38,000
Goods-train traffic ...	285,000	291,000	− 6,000	9,638,000	9,626,000	+ 12,000
Total receipts	559,000	555,000	+ 4,000	17,017,000	16,867,000	+ 150,000
S.R. (2,171 mls.)						
Passenger-train traffic...	394,000	384,000	+ 10,000	10,754,000	10,445,000	+ 309,000
Merchandise, &c. ...	70,000	74,000	− 4,000	2,119,500	2,247,000	− 127,500
Coal and coke ...	37,000	38,000	− 1,000	1,029,500	1,079,000	− 49,500
Goods-train traffic ...	107,000	112,000	− 5,000	3,149,000	3,326,000	− 177,000
Total receipts	501,000	496,000	+ 5,000	13,903,000	13,771,000	+ 132,000
Liverpool Overhead ... (6½ mls.)	1,239	1,193	+ 46	41,819	40,441	+ 1,378
Mersey (4½ mls.) ...	3,836	3,776	+ 60	140,290	143,025	− 2,735
*London Passenger Transport Board ...	524,700	527,000	− 2,300	4,832,900	4,755,700	+ 77,200
IRELAND						
Belfast & C.D. pass. (80 mls.)	3,682	3,530	+ 152	93,206	91,935	+ 1,271
,, ,, goods	439	509	− 70	17,423	17,969	− 546
,, ,, total	4,121	4,039	+ 82	110,629	109,904	+ 725
Great Northern pass. (543 mls.)	13,150	15,700	− 2,550	376,000	358,300	+ 17,700
,, ,, goods	9,900	9,650	+ 250	315,850	300,750	+ 15,100
,, ,, total	23,050	25,350	− 2,300	691,850	659,050	+ 32,800
Great Southern pass. (2,124 mls.)	33,138	32,741	+ 397	876,803	857,709	+ 19,094
,, ,, goods	30,396	32,039	− 1,643	1,177,710	1,105,903	+ 71,807
,, ,, total	63,534	64,780	− 1,246	2,054,513	1,963,612	+ 90,901

* 9th week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes

British and Irish Railways Stocks and Shares

Stocks	Highest 1934	Lowest 1934	Prices Sept. 4, 1935	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	66½	48½	47	—
5% Con. Prefce. ...	118	109	114½	−1
5% Red. Pref. (1950)	115	107	110½	—
4% Deb.	117	105	113	—
4½% Deb. ...	119	109	117½	—
4½% Deb. ...	129½	115¼	125½	−1
5% Deb.	135	126¼	135½	−2
2½% Deb.... ...	75	64	73	—
5% Rt. Charge ...	134 7/16	123¼	132½	−1
5% Cons. Guar. ...	132¾	121¾	126½	−2
L.M.S.R.				
Ord.	30½	19½	18½	+½
4% Prefce. (1923)	64¼	41	51	+1
4% Prefce. ...	87	69½	80	—
5% Red. Pref. (1955)	107	92½	101½	—
4% Deb.	114⅛	100½	104	−½
5% Red. Deb. (1952)	118 11/16	111¼	115½	—
4% Guar.... ...	106½	96¾	101½	—
L.N.E.R.				
5% Pref. Ord. ...	24¾	13½	10¼	+¼
Def. Ord.	11½	6⅞	5⅜	+⅛
4% First Prefce....	76	59½	57	+1
4% Second Prefce.	47	25½	21	—
5% Red. Pref. (1955)	94½	80	78½	—
4% First Guar. ...	104	92	97½	—
4% Second Guar.	97⅞	86½	89½	—
3% Deb.	90	74½	79½	−½
4% Deb.	114	99¼	102½	−½
5% Red. Deb. (1947)	117	108	113½	—
4½% Sinking Fund Red. Deb.	111¼	105¼	110	—
SOUTHERN				
Pref. Ord.... ...	90	63⅛	78	—
Def. Ord. ...	32⅝	19	19½	+½
5% Prefce. ...	118 5/16	107½	115½	—
5% Red. Pref. (1964)	115¾	107½	114½	—
5% Guar. Prefce.	132	120¾	128½	−1
5% Red. Guar. Pref. (1957)	119½	113	116½	−1
4% Deb.... ...	116½	103¼	112	−½
5% Deb.	134	124 13/16	133½	−3
4% Red. Deb. 1962–67	113 11/16	105 9/16	112½	−1
BELFAST & C.D.				
Ord.	6	5	8½	—
FORTH BRIDGE				
4% Deb.	110	100	107½	−1
4% Guar. ...	110	100	106½	−½
G. NORTHERN (IRELAND)				
Ord.	9¾	4 15/16	14½	+½
G. SOUTHERN (IRELAND)				
Ord.	25	12½	41	—
Prefce.	21½	13 15/16	45½	−½
Guar.	48	39	77¾	+¾
Deb.	67	59	79¼	+1¼
L.P.T.B.				
4½% "A" ...	126	115	123½	—
5% "A" ...	135½	124½	132½	−1
4½% "T.F.A." ...	113½	107½	111	—
5% "B" ...	131¾	118	127½	—
"C"	97	73	100	—
MERSEY				
Ord.	15¼	7	11	−1
4% Perp. Deb. ...	93½	82½	94½	—
3% Perp. Deb. ...	66½	61½	70½	—
3% Perp. Prefce.	54	44½	52½	—

XUM

MINISTRY OF TRANSPORT ACCIDENT REPORT

Honington, London & North Eastern Railway ; January 24, 1935

This station is on the Nottingham-Boston double line and at a point 1,420 yd. west of it is a public road level crossing No. 5. This crossing was the scene, just after 11 o'clock on the morning in question, of a collision between a down passenger train and a motor van, wherein the driver of the van was killed. Colonel Trench inquired into the accident and the accompanying sketch, which has been prepared from details given in his report, shows the crossing and its surroundings. We would add that the gateman concerned was tried on a charge of manslaughter at the Lincoln Assizes on June 7 and was found " Not Guilty."

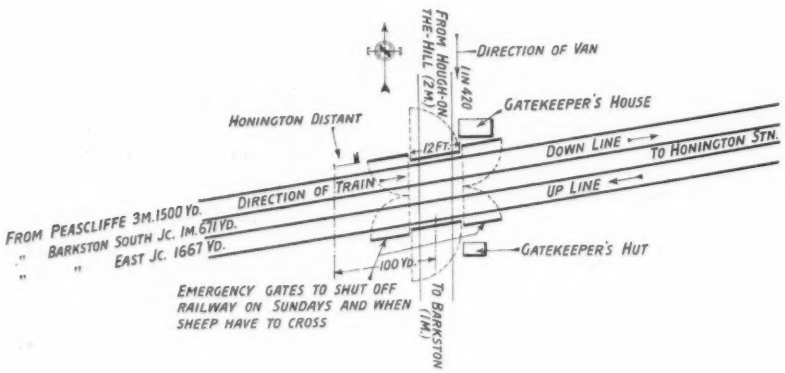


Diagram showing scene of collision

The motor vehicle was crossing the line from the north side and from the north gate a down train cannot be seen until it is within a few yards. Conversely, the driver of a down train cannot see the position of the gate or any vehicle starting to cross until the latter is on the track immediately ahead of him.

In the gatekeeper's hut there are provided indicators for up and down roads worked in the block circuit. Each indicator has three positions, the normal vertical position, meaning line closed, and *Train approaching* or *Train in section*. The *Train approaching* indication is given by the block instrument in the box ahead being pegged to *Line clear;* the *Train in section* indication is given similarly by the *Train on line* signal from the box ahead. Owing to the short distance between Barkston South Junction and East Junction boxes, down trains are offered forward from the latter as soon as they are accepted, and in consequence the *Train approaching* indication is shown immediately after a down train passes Peascliffe when it is about five to six minutes away, while the *Train in section* is shown when the train passes Barkston East Junction, a distance of approximately one mile. Arrangements to provide approximately similar periods of warning are in force for the opposite direction. The movement of the indicators does not ring a bell.

Gateman Taylor seemed to be quite confident of his knowledge of the normal working, viz., that he must keep the gates normally padlocked across the road and that he must not open them when either indicator showed *Train in section;* that he could do so with discretion when the indicator showed *Train approaching,* but in such case special care must be exercised for down trains owing to bad visibility; also that the telephone to Honington could be used to ascertain the whereabouts of an approaching train.

On this occasion Taylor said that he was standing near the gate hut when a car drew up at the north gate, the up train indicator was showing *Train in section,* and he could see the train between his gate and Honington. When the train was about half-way from Honington he stated that he saw the down indicator move to *Train approaching;* the up train passed and he reckoned that he had about four minutes, which should be enough time to let the car through before the down train arrived. He therefore opened the south gate and then crossed and opened the north gate; he said that the car made several efforts to start against the gradient " running back and jerking " and he was beginning to feel anxious about the approach of the train when the car got away and crossed the line at about walking pace. Meanwhile a baker's van which had been calling at a house a short distance north of the crossing started and came up behind the car as it got away, and passed Taylor at a distance of about a yard in rear of the leading car. Taylor stated that he had some doubts about letting the van go but decided that there was time for it to cross; he said that he had looked at his watch earlier to see how much time there was. Taylor was standing holding the gate open; he could not see and did not hear the approach of the train which struck and demolished the van.

In Colonel Trench's opinion therefore the cause of the accident was a grave error of judgment on the part of crossing keeper Taylor, who should not have assumed that there was enough margin of time before the down train arrived unless he was absolutely certain as to the period which had elapsed since the indicator had moved to *Train approaching.* He felt little doubt that if Taylor had had the additional responsibility of placing the gates across the railway when opening them to the road, he would not have taken the risk of letting the car across before the train, apart from which it is possible that the driver might have seen the gates in time to stop the train.

It is evident, therefore, that the provision at this crossing of gates closing alternately across road and rail, and preferably protected by interlocked signals, would be advantageous from the safety aspect; such gates would fence the line when open for the road and avoid the maintenance of the existing additional gates which are brought into use for this purpose when necessary. On the other hand, the road traffic is light and it cannot be said that conditions here are difficult. Colonel Trench hardly feels justified, therefore, in recommending, as a matter of urgent importance, the provision of up-to-date equipment at this crossing, possibly to the prejudice of other crossings where it may be more urgently required. Where such gate equipment at public road level crossings exists, he thinks it is necessary that full and clear instructions as to the operation of the gates and their locking normally across the road should be posted in the gate-hut and gate-keeper's lodge, such instructions to include information as to the place and distance from which warnings are received, and the minimum probable period which will elapse between the receipt of the warning and the arrival of a train.

Colonel Trench understands that there are a number of other public road crossings with similar old-fashioned gate equipment, and he suggests that the company should review their conditions and equipment and take steps to issue suitably printed instructions or effect any necessary modifications therein. While warning apparatus is not a substitute for outdoor interlocked signals, it is obvious that it and the instructions for operation should be as comprehensive as possible in cases where such signals are not provided.

The report concludes by observing that cases such as this, where a road vehicle is involved in accident at a public road level crossing, through no fault of the road driver, are fortunately rare. Their rarity is a tribute to the competence and vigilance of crossing keepers in general, and their occurrence is a reminder that this standard must not be relaxed.

OFFICIAL NOTICES

University of London Commerce Degree Bureau

THE Official Institution of the University for the assistance of External Students preparing for the Commerce Degree Examinations of the University of London who are unable to attend regular College Lectures.
For prospectus apply to Secretary (Mr. H. J. Crawford, B.A.), 46, Russell Square, W.C.1.

RAIL RATES CLERK with good experience of General Merchandise wanted in Commercial House. State age, experience, salary required and if at present disengaged.—Box 30, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, London, S.W.1.

APPLICATIONS are invited for two vacancies in the Structural Department of a large European firm of Structural Engineers in India. (A) A designer, thoroughly experienced and capable of undertaking designs of steel structures and bridges. It is desirable that those applying for this post should have some practical shop experience and possess recognised engineering diplomas. (B) An experienced estimator able to prepare estimates and complete calculations for steel structures and bridges. Applicants are requested to state which particular post they are applying for and enclose full details of experience and copies of references addressed in the first instant to "ENGINEER," c/o W. ABBOTT, LTD., 32, Eastcheap, London, E.C.3.

PATENTS for Inventions, Trade Marks, Advice, Handbook, and consultations free. King's Patent Agency, Ltd. (B. T. King, C.I.M.E., Registered Patent Agent, G.B., U.S., and Canada), 146a, Queen Victoria Street, London, E.C.4. 49 years' references. 'Phone City 6161.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Thursday. All advertisements should be addressed to :—*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

CONTRACTS AND TENDERS

The Economical Boiler Washing Co. Ltd. has received from the L.N.E.R. a contract for a hot water boiler washing plant for the locomotive depot at Hornsey. This will be of the double pump double tank type, and will be the twentieth installation on this railway.

Further Orders for Scammell Mechanical Horses

Following the announcement in THE RAILWAY GAZETTE of August 23 that the L.M.S.R. had placed its ninth repeat order for 100 Scammell mechanical horses, we now learn that the same railway has also ordered 287 trailers fitted with Scammell patent automatic couplings. In addition Scammell Lorries Limited has received its seventh repeat order for 40 similar motive units and 90 trailers from the L.N.E.R. The G.W.R. has also placed its seventh repeat order for 118 motive units and 211 trailers. Including the above, the total orders for Scammell vehicles placed by the four group railways to date amount to 1,880 Scammell mechanical horse motive units and 3,250 trailers fitted with Scammell patent automatic coupling gear.

George Spencer Moulton & Co. Ltd. has received an order from the Buenos Ayres Great Southern Railway for 14,100 indiarubber concentric springs.

The Great Western Railway has placed orders for equipment at Swindon works as follow :—

H. W. Ward & Co. Ltd. : a capstan lathe.
J. Lund Limited : an internal grinding machine.
J. Kirk & Sons Ltd. : a planing machine.
Muir Machine Tools Limited : a 14-in. slotting machine.
British Oxygen Co. Ltd. : a 55-in. universal oxygen cutting machine.
Selson Machine Tool Co. Ltd. : a universal cutter grinding machine.

The Egyptian State Railways Administration has placed orders for signalling material with Westinghouse Brake & Signal Co. Ltd., W. F. Dennis & Co., and Stewarts and Lloyds Limited. The administration has also placed orders with the Equipment & Engineering Co. Ltd. for an electromagnetic crack detector, the Stahlwerke Verband Akt. for sleepers, Stahlunion Export G.m.b.H. for clips and clip-bolts, and Gresham & Craven Limited for injectors.

Following the announcement in THE RAILWAY GAZETTE for August 23 that Walker Bros. (Wigan) Ltd. had received an order for the engine, power bogie, hydraulic coupling and gearbox, &c., required for an articulated two-coach diesel railcar for the G.N.R. (I.), we now learn that the order is for two power bogies for two such units.

J. Stone & Co. Ltd. has received an order for 8,925 brass axlebox bearings complete with antifriction lining for the Buenos Ayres Great Southern Railway.

The Metropolitan-Vickers Electrical Co. Ltd. has received a part contract from the Southern Railway for Cosmos electric lamps for a period of 12 months ending August 31, 1936.

British Insulated Cables Limited has received orders for 28 miles of copper contact wire, 52 miles of copper line wire, and 21,000 railbonds for the extension of the Bombay electrified lines of the B.B.C.I.R. The same company has also received an order for 85 tons of cadmium-copper trolley wire for the trolleybus extensions of the London Passenger Transport Board.

Leyland Motors Limited has received the following orders for vehicles of types as specified from railway-associated bus companies : East Kent Road Car Co. Ltd., 16 Tiger ; Thames Valley Traction Co. Ltd., six oil-engined Tiger ; Wilts & Dorset Motor Services Limited, two Tiger ; Southdown Motor Services Limited, six Tigress ; and H.M.S. Catherwood Limited, two oil-engined Beaver-Six.

The G.I.P. Railway is calling for tenders, to be presented in Bombay by September 30, for the supply of six 63-ft. 6-in. semi-through spans for Nalganga bridge. Further details can be obtained upon application to the Department of Overseas Trade.

The Chief Controller of Stores, Indian Stores Department (Engineering Section), Simla, invites tenders for five overhead electric travelling cranes (two of 10, one of 15, and two of 30 tons), complete with d.c. electrical equipment, for carriage and wagon shops, Moghalpura, North Western Railway. Tenders will be received up to October 3 next.

We are advised by the Associated Equipment Co. Ltd. that since the Regent double-deck bus was introduced in 1929, no fewer than 3,905 have been sold to municipal, public, and private transport organisations.

Latvian Rolling Stock

Wagon and truck manufacturers in Latvia are very busy at present, learns Reuters Trade Service from Riga, because the Latvian Railway Administration wishes to replace old rolling stock, which is no longer in keeping with modern requirements, by new steel wagons, and has accordingly distributed a number of large orders. Workshops at the port of Liepaja are constructing five passenger coaches for internal services ; these coaches will be completed next spring. The same works are also making three modern four-axle vans for the carriage of mail and packages. A factory at Riga is building twelve second and third class bogie passenger coaches. It is understood that the railway administration will place orders later for thirty open trucks for the transport of bulky goods like timber, coal and sugar beet. Eight motor-bus chassis have been imported for the road services operated by the railways ; bodies for these chassis will be made in Latvia.

Forthcoming Events

Sept. 10 (*Tues.*).—Permanent Way Institution (Sheffield), at Royal Victoria Hotel, 7 p.m. "Curves," by Mr. W. C. Thompson.
Sept. 13 (*Fri.*).—Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "Power-Operated Signals," by Mr. E. Wallis.
Sept. 19–28.—"The Model Engineer" Exhibition, at Royal Horticultural Hall, Vincent Square, London, S.W.1.
Sept. 21 (*Sat.*).—Permanent Way Institution (Manchester-Liverpool), at Blackpool, 3 p.m. "The Permanent Way," by Mr. H. L. Douglas ; "Removing a Building," by Mr. F. McCandlish.
Oct. 1 (*Tues.*).—Retired Railway Officers' Society, at Abercorn Rooms, Liverpool Street, London, E.C.2, 2.30 p.m. Ordinary Meeting.
Oct. 2 (*Wed.*).—Permanent Way Institution (Leeds), at Quebec House, Quebec Street, 7.30 p.m. "Some Permanent Way Problems," by Mr. R. Gurd.
Oct. 2–12.—International Exhibition of Inventions, at Central Hall, London, S.W.1.
Oct. 8 (*Tues.*).—Permanent Way Institution (Sheffield), at Royal Victoria Hotel, 7 p.m. "Activities at Redbridge Permanent Way Shops and Sleeper Depot," by Mr. S. G. Reed.

XUM

Railway Share Market

The stock and share markets commenced the week under the disturbing influence of the European political situation, but more optimistic views prevailed later and steadier conditions developed. Home railway stocks which have a prior charge and bear a fixed rate of interest were subject to the same trend as British Government and other gilt-edged stocks, with the result that pressure to sell caused Stock Exchange dealers to mark prices down out of proportion to the amount of stock offered or the business done.

One example of the position will suffice. Hammersmith and City consolidated ordinary stock, which is a leased rental stock and, therefore, virtually gilt-edged, was marked down in price 3½ points to 135-138, but there has been no business in the stock for the last six months. Many debenture stocks were reduced from one to two points and at the lower figures tempted many investors, who take the view that the monetary situation in this country still points to the demand for investments being renewed when the Italo-Abyssinian trouble is "localised." Ordinary stocks also exhibited a better disposition. Many brokerage firms were recommending their clients to take advantage of the fall in prices to average, notably in Southern deferred, which is about 13 points below last year's best before the benefits from the big electrification schemes had accrued. Less attention was given to the railway traffic receipts on Wednesday, as the public is learning to ignore the Stock Exchange forecasts of traffic returns since it is not possible for anyone, however expert, to estimate the takings of the four railways in any one week with any degree of accuracy.

Foreign railway stocks did not receive much attention. Reports of rains in Argentina and the latest trade figures failed to stimulate active interest in Argentine railway stocks, although there is a fair amount of buying for locking up at the present quotations. These are the lowest touched for very many years and give scope for substantial appreciation when conditions move more in favour of the railways. It is understood that the market is looking for a favourable outcome of the visit of certain directors and experts to Argentina to discuss with Argentine bankers the damage to Argentine national credit which is being caused by the absence of Argentine railway dividends owing to exchange difficulties.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1934-35	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1934	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1934	Prices: Lowest 1934	Prices: Sept. 4, 1935	Yield % (See Note)
				£	£		£	£	£					
South & Central America.	Antofagasta (Chili) & Bolivia	830	1.9.35	10,390	— 8,410	35	428,010	489,790	— 61,780	Ord. Stk.	26¾	19	18½	Nil
	Argentine North Eastern	753	31.8.35	8,679	+ 275	9	73,086	71,428	+ 1,658	,,	11	6⅞	6	Nil
	Argentine Transandine	111	—	—	—	—	—	—	—	A. Deb.	52	45	48	8 5/16
	Bolivar	174	July, 1935	5,300	+ 200	30	44,700	43,850	+ 850	6 p.c. Deb.	10	6½	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	13¾	10 7/16	13	3 15/16
	Buenos Ayres & Pacific	2,806	31.8.35	69,877	+ 920	9	648,036	631,624	+ 16,412	Ord. Stk.	16½	8½	7	Nil
	Buenos Ayres Central	190	24.8.35	$117,200	— $23,700	8	$984,000	$1,057,600	— $73,600	Mt. Deb.	23	10	16	Nil
	Buenos Ayres Gt. Southern	5,085	31.8.35	23,723	+ 2,989	9	1,044,972	1,118,768	— 73,796	Ord. Stk.	35	22	19½	Nil
	Buenos Ayres Western	1,930	31.8.35	42,102	+ 2,498	9	359,529	393,585	— 34,056	,,	27½	18½	15	Nil
	Central Argentine	3,700	31.8.35	114,298	— 14,406	9	1,069,520	1,181,024	— 111,504	,,	23	13½	11	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	14	7	6	Nil
	Cent. Uruguay of M. Video	273	31.8.35	7,484	— 9,321	9	74,052	148,591	— 74,539	Ord. Stk.	15½	3	4½	Nil
	Do. Eastern Extn.	311	31.8.35	1,209	— 96	9	11,751	12,740	— 989	—	—	—	—	—
	Do. Northern Extn.	185	31.8.35	932	+ 255	9	9,562	7,398	+ 2,164	—	—	—	—	—
	Do. Western Extn.	211	31.8.35	894	+ 169	9	6,264	5,320	+ 944	—	—	—	—	—
	Cordoba Central	1,218	31.8.35	$2,300	+ 1,610	9	302,220	309,560	— 7,340	Ord. Inc.	6	3	1½	Nil
	Costa Rica	188	July, 1935	13,730	— 4,451	4	13,730	18,181	— 4,451	Stk.	30¾	23½	34	5⅞
	Dorada	70	July, 1935	13,600	+ 3,600	30	80,400	70,200	+ 10,200	1 Mt. Db.	103	95	102½	5⅞
	Entre Rios	810	31.8.35	12,713	+ 908	9	109,548	96,642	+ 12,906	Ord. Stk.	21½	12	9½	Nil
	Great Western of Brazil	1,082	31.8.35	5,200	— 2,500	35	257,500	263,200	— 5,700	Ord. Sh.	7⅛	5⅛	5⅛	Nil
	International of Cl. Amer.	794	July, 1935	$328,485	+ $25,683	30	$2,960,671	$3,022,796	— $62,125	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/-	1/-	1/2	Nil
	La Guaira & Caracas	22 3/4	Aug., 1935	3,855	— 75	35	31,425	29,820	+ 1,605	Stk.	12¾	7⅝	8½	Nil
	Leopoldina	1,918	31.8.35	19,812	— 9,785	35	591,043	753,734	— 162,691	Ord. Stk.	14⅝	7	3½	Nil
	Mexican	483	21.8.35	$212,700	+ $4,300	8	$1,785,100	$1,654,100	+ $131,000	,,	3¼	1½	1/2	Nil
	Midland of Uruguay	319	July, 1935	5,218	— 4,243	4	5,218	9,461	— 4,243	,,	1/2	1/2	1½	Nil
	Nitrate	401	31.8.35	7,524	+ 3,000	35	101,134	95,065	+ 6,069	Ord. Sh.	32 9/32	51/-	21¼	Nil
	Paraguay Central	274	31.8.35	$2,371,000	+ $1,295,000	9	$16,520,000	$8,837,000	+ $7,683,000	Pr. Li. Stk.	84	67	77½	7¾
	Peruvian Corporation	1,059	Aug., 1935	74,684	+ 4,636	9	148,497	122,665	+ 25,832	Pref.	14½	8	9½	Nil
	Salvador	100	24.8.35	¢9,200	— ¢1,420	8	¢97,636	¢82,407	+ ¢15,229	Pr. Li. Db.	75	70	65§	7 11/16
	San Paulo	1531/2	25.8.35	22,339	— 1,601	34	871,105	935,750	— 64,645	Ord. Stk.	86	67	39½	6 5/16
	Taltal	164	July, 1935	2,525	— 103	4	2,525	2,628	— 103	Ord. Sh.	2⅛	1 7/16	1½	6 11/16
	United of Havana	1,365	31.8.35	15,024	— 168	9	163,000	158,402	+ 4,598	Ord. Stk.	6	2	2	Nil
	Uruguay Northern	73	July, 1935	612	— 444	4	612	1,056	— 444	Deb. Stk.	6¼	3	4½	Nil
Canada.	Canadian National	23,714	21.8.35	627,977	+ 41,998	33	20,855,866	20,427,117	+ 428,749	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	— 4 p.c.	Prep. Dbs.	78¼	51½	55½	7 5/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104½	97¼	99	4 1/16
	Canadian Pacific	17,211	31.8.35	773,600	— 16,000	35	15,719,000	15,771,600	— 52,600	Ord. Stk.	18 5/16	11 1/16	10	Nil
India.†	Assam Bengal	1,329	10.8.35	31,027	— 4,778	19	425,724	512,867	— 87,143	Ord. Stk.	88½	72	82½	3⅝
	Barsi Light	202	10.8.35	2,617	— 270	19	56,317	60,892	— 4,575	Ord. Sh.	104½	98¾	88½	6 5/16
	Bengal & North Western	2,114	20.8.35	54,308	+ 2,081	20	1,007,673	1,031,985	— 24,312	Ord. Stk.	297½	262	299½	5 5/16
	Bengal Dooars & Extension	161	10.8.35	3,692	— 985	19	44,288	50,253	— 5,965	,,	125¼	124	125½	5 9/16
	Bengal-Nagpur	3,268	31.7.35	164,700	+ 5,136	17	2,153,262	2,044,800	+ 108,462	,,	105½	96	101½	3 15/16
	Bombay, Baroda & Cl. India	3,072	20.8.35	166,950	— 375	20	3,076,950	3,092,025	— 15,075	,,	115	108½	113½	5 5/16
	Madras & South'n Mahratta	3,230	10.8.35	130,350	— 11,176	19	1,998,401	2,211,333	— 212,932	,,	131	122¾	121½	7 1/16
	Rohilkund & Kumaon	546	20.8.35	9,001	— 1,082	20	190,149	199,004	— 8,855	,,	263	250	292½	5½
	South India	2,526	10.8.35	104,022	— 7,010	19	1,501,069	1,529,510	— 28,441	,,	119	115	117½	6 3/16
Various.	Beira-Umtali	204	June, 1935	56,051	— 1,046	38	576,265	456,945	+ 119,320	—	—	—	—	—
	Bilbao River & Cantabrian	15	July, 1935	1,129	— 1,393	30	11,034	12,982	— 1,948	—	—	—	—	—
	Egyptian Delta	622	20.8.35	5,971	— 68	20	76,206	77,425	— 1,219	Prf. Sh.	2 15/16	1¾	1¾	5 1/16
	Great Southern of Spain	104	24.8.35	1,873	— 773	34	59,542	70,804	— 11,262	Inc. Deb.	4	3½	3½	Nil
	Kenya & Uganda	1,625	July, 1935	180,643	+ 18,481	30	1,473,420	1,385,090	+ 88,330	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50	33	40	8¾
	Mashonaland	913	June, 1935	102,039	— 7,073	38	1,047,960	840,132	+ 207,828	1 Mg. Db.	101	91¾	103½	4 15/16
	Midland of W. Australia	277	July, 1935	11,008	— 889	4	11,008	11,897	— 889	Inc. Deb.	100	93	94½	5 5/16
	Nigerian	1,905	13.6.35	23,768	— 6,010	15	375,493	385,356	— 9,863	—	—	—	—	—
	Rhodesia	1,538	June, 1935	182,536	— 1,260	38	1,723,519	1,418,680	+ 304,839	4 p.c. Db.	104⅞	97½	104	3 15/16
	South African	13,225	10.8.35	529,180	+ 54,460	19	10,278,602	9,297,656	+ 980,946	—	—	—	—	—
	Victorian	4,728	Apl., 1935	799,418	+ 68,999	43	7,962,662	7,716,599	+ 246,063	—	—	—	—	—
	Zafra & Huelva	112	July, 1935	11,227	+ 167	30	76,472	76,861	— 389	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rate of exchange and not on the par value

Diesel Railway Traction

The Modern Egyptian Chariot

THOSE who attended the International Railway Congress at Cairo in January, 1933, will realise at once the wisdom of the Egyptian State Railways in introducing diesel railcars of up-to-date design for providing fast and comfortable travel over the desert, and there can be little doubt that the clean, cool atmosphere and more frequent services will make these air-conditioned cars (described elsewhere in this issue) very popular with the Egyptians themselves. Had it not been for the exceptionally good water, a rare feature in a desert land, but due to the Nile, we believe that diesel traction would have come to the land of the Pharaohs before now. Even without the advantage of eliminating costly boiler repairs, the inherent operating characteristics of the diesel railcar were sufficient to ensure the adoption of such motive power, for there is no question of these ten cars having been found in the bulrushes. The present Chief Mechanical Engineer of the Egyptian State Railways is a man experienced in diesel locomotives—and in a tropical country, too—so these railcars should receive wise and sympathetic care, an important point when a railway is adopting tractive units which, although they may be standard equipment elsewhere, are new to the staff concerned. The design of the cars is a notable example of a well-tried design adapted in its details to meet the exigencies of local conditions, and despite the maintenance difficulties which may crop up due to the sand and dust-laden atmosphere, and to the inexperience of the staff, the cars should be distinctly an easier proposition for the running department than the displaced steam locomotives.

Mass Production

MUCH is being made of the diesel locomotive factory now under erection in America for the General Motors Corporation, the maker of the two-stroke Winton engine used in several of the U.S.A. high-speed diesel trains. But the mass production methods claimed for this factory appear to be little more than the *modus operandi* of any up-to-date locomotive erecting shop. It is most unlikely that diesel locomotives will ever be erected on the carrier belt system, and even if the hopes of the most sanguine were to be realised, and practically every railway motive power unit from Dagenham to Kamschatka dieselised, the number of necessary types and the number of needy builders would prevent locomotives being turned out like safety pins or V8's. Moreover, although mass production methods may be applied to certain constituents, such as diesel engine or transmission details, it is not economical to do this for the railway market alone, and the parts must be capable of use in other fields before the principles of technocracy can be applied to the full. Objection to such statements may be made by those who believe that for any given country something approaching a universal mixed traffic locomotive can be evolved, which ultimately might be built in large numbers. But for the success of mass production the large number of units must be produced in the shortest amount of time, and even with a hundred identical locomotives a year for ten years it is doubtful whether the mechanical portion and its constituents could be fabricated and erected on a better system than that now favoured in modern workshops.

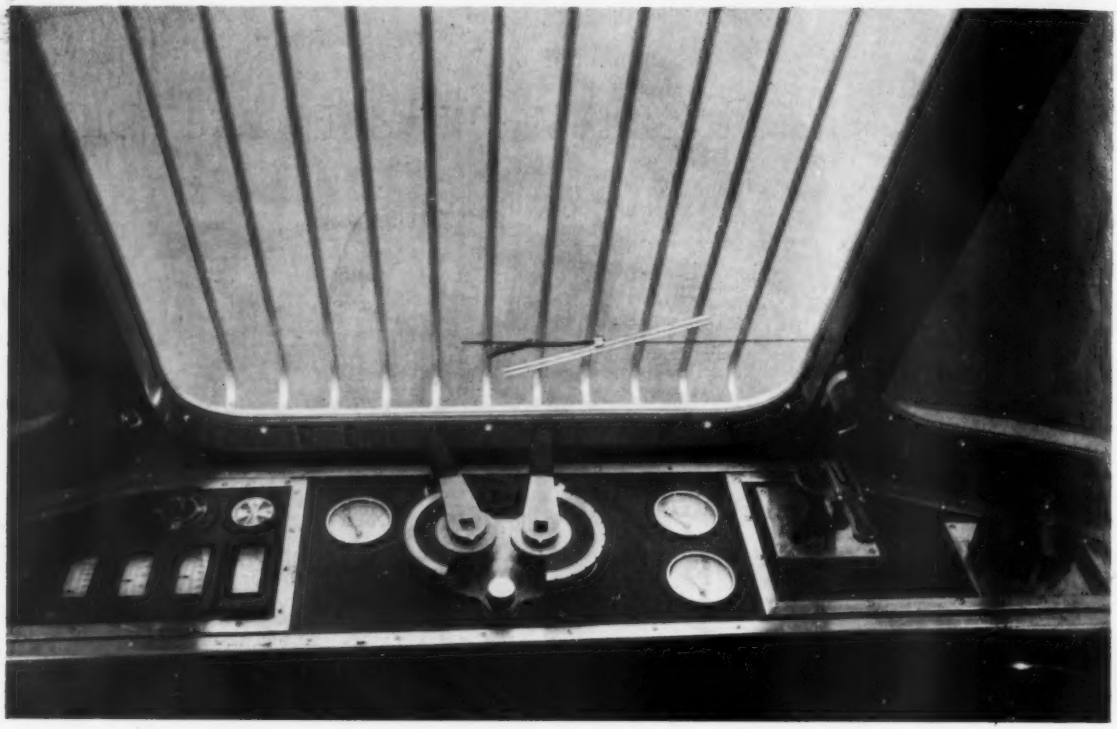
The Silver Streak

THE late Beerbohm Tree is reputed to have written to a budding playwright, whose *magnum opus* he had been requested to read, " My Dear Sir, I have read your play. Oh! My *Dear* Sir!" Similar sentiments spring to the breast after sitting through a performance of " The Silver Streak," Hollywood's effort at entwining the stainless steel Burlington Zephyr with the playfulness of the laughing Love God. Although it cannot be said that American railroading is portrayed in the manner it is actually carried out, there is, at least, a remarkable tribute paid to the superb construction of the two-stroke Winton engine, for there comes a time in the film when the villain, who, alack, is a well-known diesel expert, appears to tamper with the delicate mechanism in the neighbourhood of the fuel pump with what is described in police courts as a large blunt instrument. The only result is a gradual increase in speed to the startling figure of 140 m.p.h. We say startling because when the speedometer registers this figure the driver is indulging in five minutes of the Cumberland and Westmorland style in the engine room, having first carefully wedged his dead-man handle with an appliance which looked as if it had been specially ordered for the purpose by the C.M.E. Apparently, Hollywood has no use for the simple knotted handkerchief. Some of the shots of the Zephyr, possibly taken on the occasion of its record run from Denver to Chicago, are distinctly good, but the celerity with which steam trains were shunted off the line when it was realised that the Silver Streak was out of control, made it obvious that electric traction has no future where high acceleration rates are required. It was obvious, also, that the money which the railroad would have to pay out for goods damaged during shunting would not tend to make the streamliner popular with the G.M., despite the hero's claim that it was 75 per cent. cheaper to operate than steam units. However, such earthly considerations are of little weight to the gentlemen behind the megaphones. Nevertheless, to those who like a little hair raising with their diesel traction, we recommend ninepennyworth in the stalls, after making it quite clear that we have neither financial nor executive interest in any branch of the cinematograph industry.

Railcar Resistance

THE rapidly increasing use of diesel railcars is making it most desirable that definite data regarding the resistance to movement should be at the disposal of designers, and numerous tests are now being made with a view to assisting engineers in the preparation of future designs. The cult of the high speed train naturally has led to numerous wind-tunnel experiments in order to determine the wind resistance, but the resistance of other components is being investigated just as thoroughly, and it appears that reliable formulæ and material will be available at no distant date.

XUM



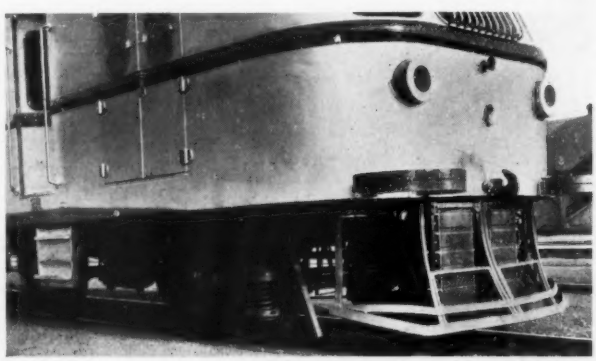
Looking down on the driving position

Luxury Rail Travel Over Desert Lines in Egypt

Ten air-conditioned diesel cars are being put into service round Cairo and Alexandria

AT a cost of £E.7,585 per unit, the Egyptian State Railways ordered in July, 1934, ten 220/275 b.h.p. diesel-mechanical railcars from Ganz & Co. of Budapest, to a specification which was most stringent as regards the satisfactory performance of the vehicles in actual service, and which called for certain unusual fittings to meet the exigencies of the Egyptian climate.

The first five of these railcars have been delivered, and have undergone tests on various sections of the line. The illustration at the bottom of the opposite page shows one of the vehicles between Port Tewfik (Suez) and Pont Limoun (Cairo) on the occasion of a trial trip over the Suez direct line, when the 144·5 km. (90 miles) were covered in a net running time of 114 min., with a maximum speed of 105 km.p.h. (65·2 m.p.h.). It is anticipated that two regular railcar services in each direction daily will be inaugurated shortly over this route, and these diesel cars also will operate services over the following lines: Bab-el-Louk-Helwan, Cairo-Barrage (winter only), Alexandria-Hammam Luka, and Alexandria-Abu Qir (summer only).



End condenser for air-conditioner

Of the double-bogie type with one driving and one carrying bogie, these Egyptian railcars are very similar in general design to the express cars of the Hungarian State Railways which maintain an international service between Budapest and Vienna. Being intended for solo operation, they are fitted with the lightest buffers and drawgear, and to avoid the necessity of turntables they have a driving compartment at each end of the semi-streamlined body. The designed top speed is 110 km.p.h. (68·3 m.p.h.), but during some preliminary trials in Hungary a speed of 117 km.p.h. (73 m.p.h.) was reached, and a rate of 100 km.p.h. (62·1 m.p.h.) attained from rest in 3 min. 24 sec. on the level. Braking tests showed that the car could be stopped from a speed of 110 km.p.h. (68·3 m.p.h.) in 500 m. (550 yd.) within 30 sec., the brakes being of the normal Westinghouse type with two blocks on

each wheel. These standard-gauge cars were run on their own wheels from the maker's works at Budapest to Bremen, from which port they were shipped to Port Said in a semi-erected condition.

Some of the cars have first and second class seats, and the remainder first and third class, the total in each case being 70. Lavatory and luggage accommodation is provided in both types. The weights of the railcars are as follow:—

	1st and 2nd	1st and 3rd
Tare weight, tonnes	36·8	35·6
Weight with supplies, but without passengers	37·55	36·35
Weight complete with 70 passengers and luggage	42·5	41·25
Fuel capacity	340 kg.	
Water capacity	340 kg.	

The tare weight is thus equivalent to 1,140 lb. per seat, and the b.h.p. per ton of tare (at the continuous engine rating of 220 b.h.p.) 6·1, taking an average for the two patterns of car.

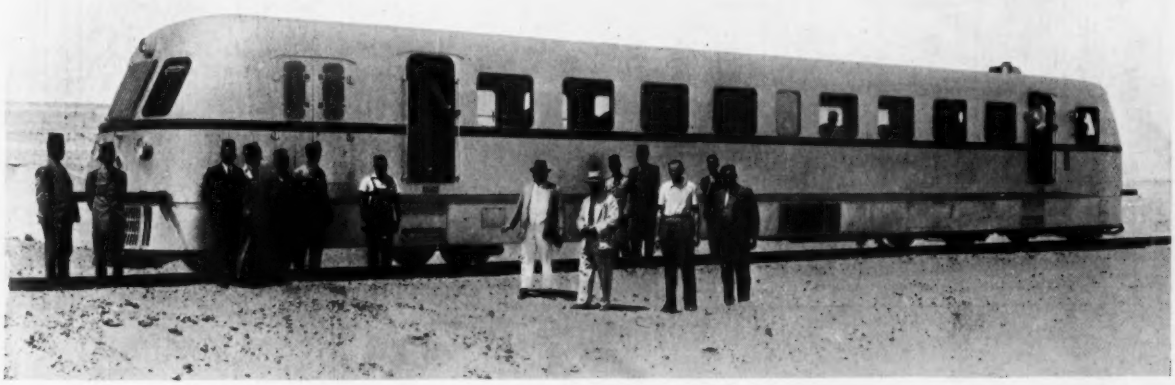
Power Unit and Transmission

Mounted directly on one bogie, the engine and five-speed gearbox are both of Ganz design and construction, and the layout of the complete unit can be seen in the accompanying detailed arrangement drawings. The six-cylinder (170 mm. by 220 mm.) Ganz-Jendrassik engine develops a continuous output of 220 b.h.p. at 1,250 r.p.m. and a maximum of 275 b.h.p. at 1,450 r.p.m., and has a weight of approximately 20 lb. per b.h.p. on the continuous rating. The design of this type of engine has been described in past issues of the *Diesel Railway Traction Supplement*, and a cross-section of a 365/400 b.h.p. unit was reproduced in the issue of February 22, 1935. The engines of the Egyptian cars represent the latest practice, particularly as regards materials. The crankshaft is of nickel-chrome-molybdenum steel supported on seven bearings, and the pistons and crankcase are of light metal. A double-walled protective casing covers the top of the engine where it projects through the engine-room floor, and provides heat and noise insulation. The combustion air is drawn in through the air-conditioned passenger compartments, thereby preventing the ingress of sand and dust, which are prevalent in the Egyptian atmosphere. The drive of the engine and railcar auxiliaries, including the air-conditioning plant, is shown in one of the drawings reproduced with this article.

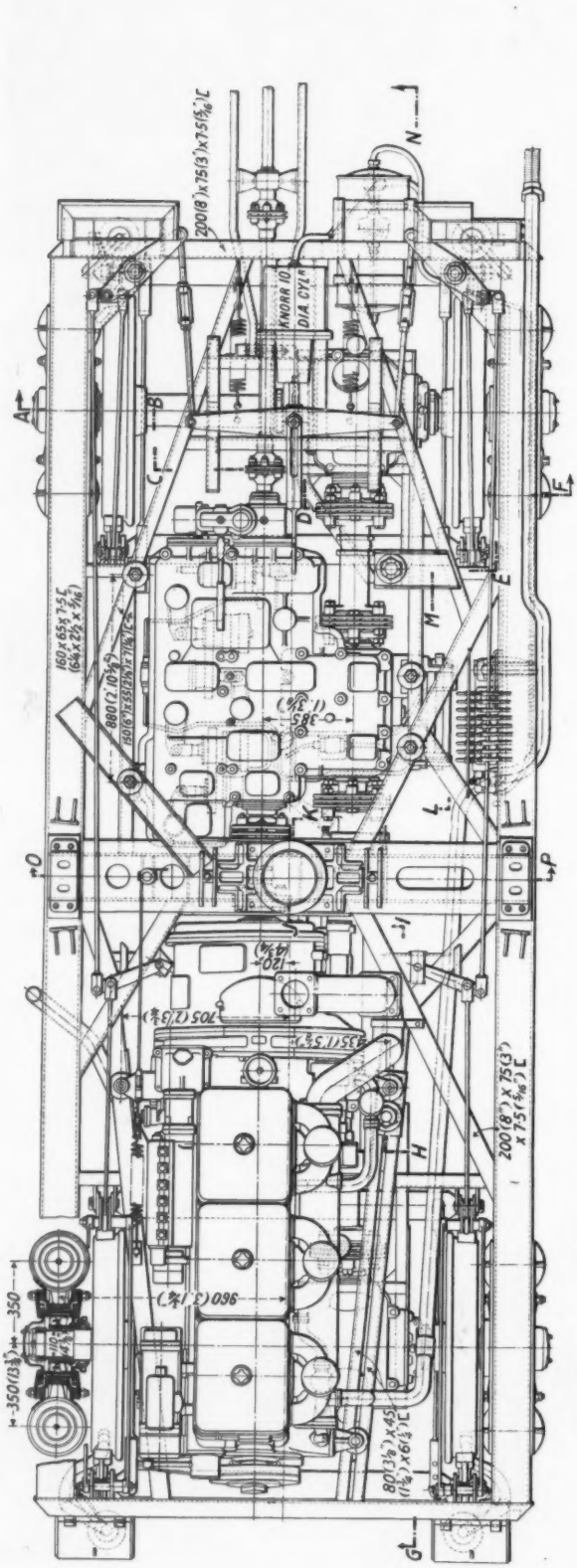
The main clutch and the reversing gear are housed in a steel casing bolted directly to the engine crankcase.

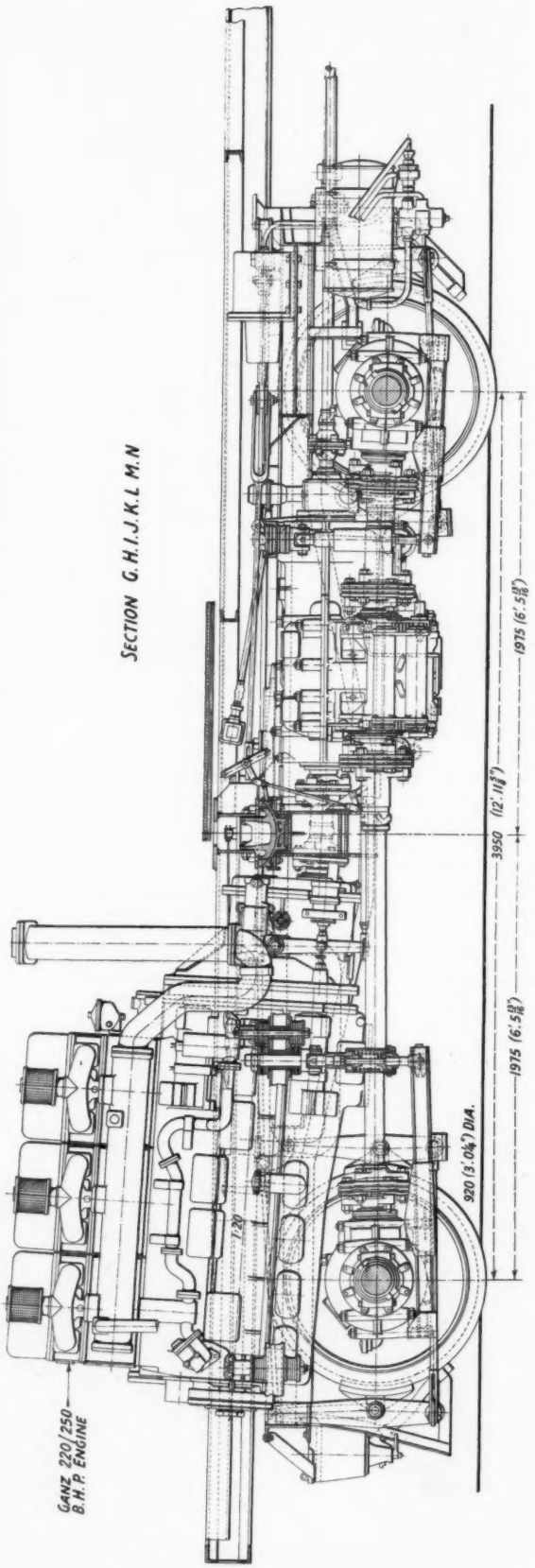
Arrangement of second class seats

The main clutch is of the multiple-disc friction type with Ferodo linings. Of similar design to that illustrated in the issue of this Supplement for July 12 (p. 89), the Ganz five-speed transmission has gear wheels of nickel-chrome steel in permanent mesh. The gears run in oil within a light-metal case, and gear-changing is effected by compressed air actuating servo-motors which are controlled from the driver's cabins. The controlling handle is the right of the two centre levers to be seen in the illustration at the head of this article; the left centre handle is the throttle control, the far right the Westinghouse brake driver's valve, and the middle right the



One of the new Egyptian State Railways diesel cars on a trial run from Suez to Cairo





Longitudinal cross section and plan of driving bogie, Ganz 220 b.h.p. diesel-mechanical railcar for Egypt

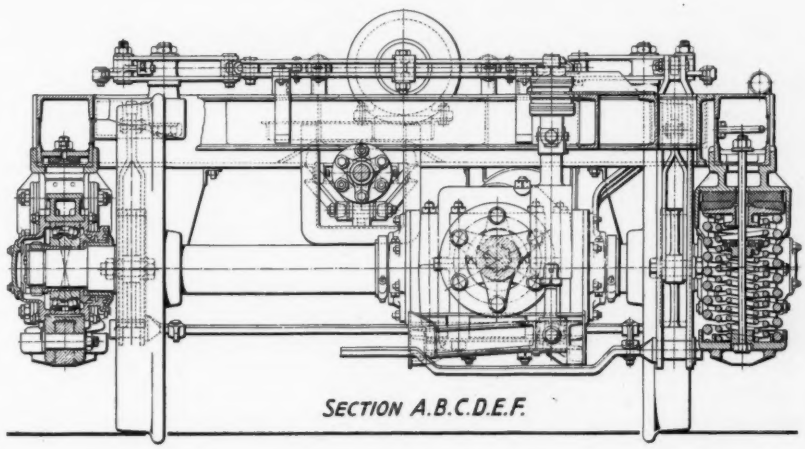
reversing handle. Friction clutches are used also in the gearbox. The drive is led from the gearbox through cardan shafts with Hardy-Spicer flexible couplings to single bevels on each axle of the driving bogie. Torque rods take the driving thrust from the casing of each axle drive and transmit it to the frame. The engine and gearbox are supported on the bogie frame structure through the intermediary of rubber cushioning springs.

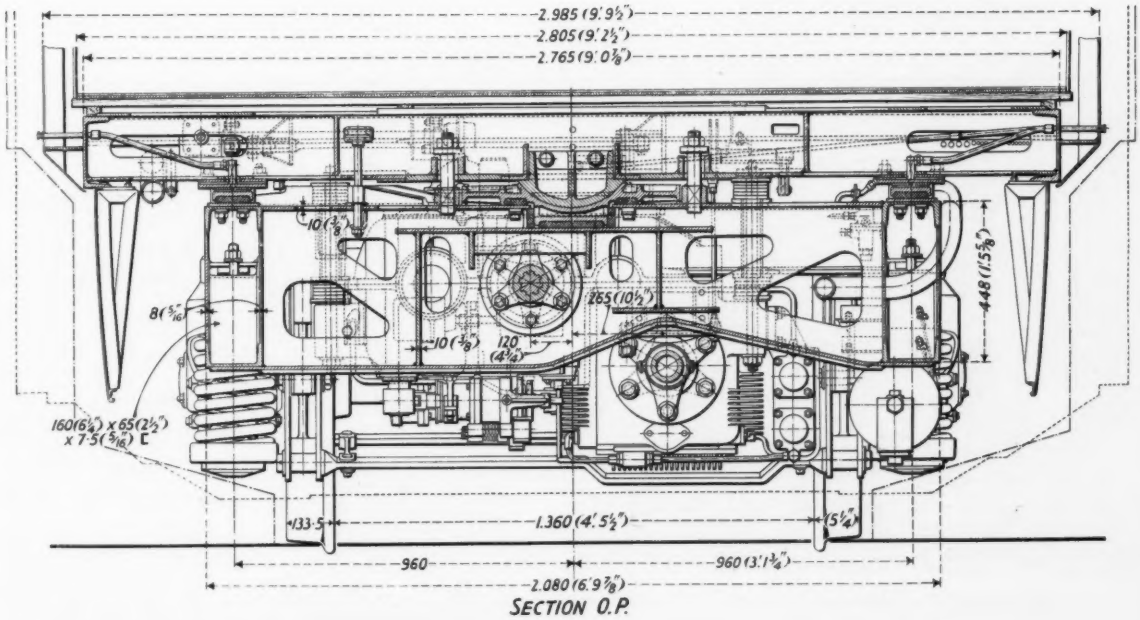
The Bogies

Although incorporated in a fast railcar, the bogies are of the non-bolster type, and the weight is carried wholly on eight triple-helical springs, mounted one on each side of the roller-bearing axleboxes. Although the engine is mounted in front of the pivot, it has been found possible to get the latter on the centre of the wheelbase, which, in the case of the driving bogie, extends to no less than 3·95 m. (12 ft. 11 in.), and in the carrying bogie to 3·5 m. (11 ft. 5½ in.), the wheels in each case being of 920 mm. (36 in.) diameter. Side frames of the girder type (made up of top and bottom channels with welded side pieces) are used as the foundation, and the whole bogie frame structure is welded together to form a light yet rigid unit, the lightness being obtained partly by the use of electric welding and partly by reason of the 50-60 kg./sq. mm. (32/38 tons per sq. in.) chrome steel of which the various members are made. From the drawings it will be seen that everything possible has been done to reduce weight without impairing the rigidity of the structure. The unstressed portions of the bogie cross stretchers have been cut away, and steel castings have been used for such details as the spring brackets.

A special feature of the bogie is that the hemispherical pivot has no centre pin, and when the railcar is lifted complete, the weight of the bogie is suspended on the washers of two pins located about one foot from the pivot centre on the transverse centre line. Flat side bearers are used and both the top and bottom halves have rubber cushions, a feature which has been used in other parts of the bogie, *e.g.*, above the helical bearing springs, and below the main pivot, and by this means the transmission to the passenger saloons of noise and vibrations arising

Cross sections of driving bogie of diesel-mechanical railcar of the Egyptian State Railways





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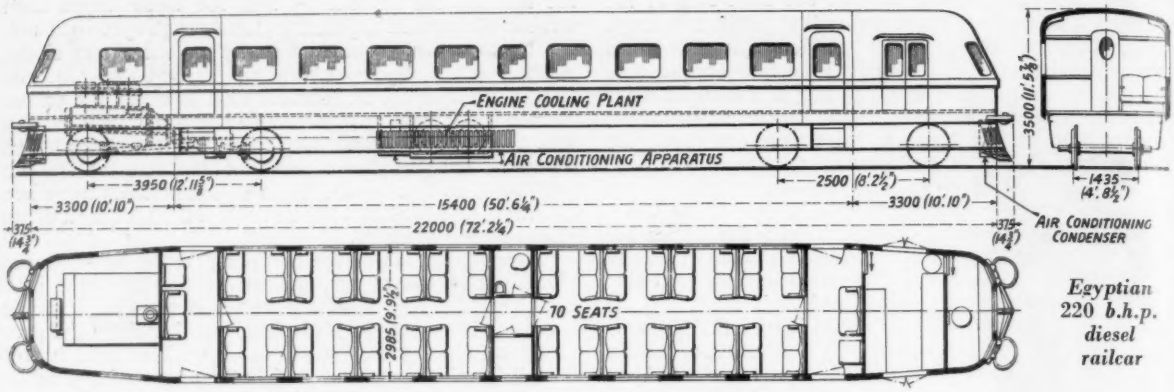


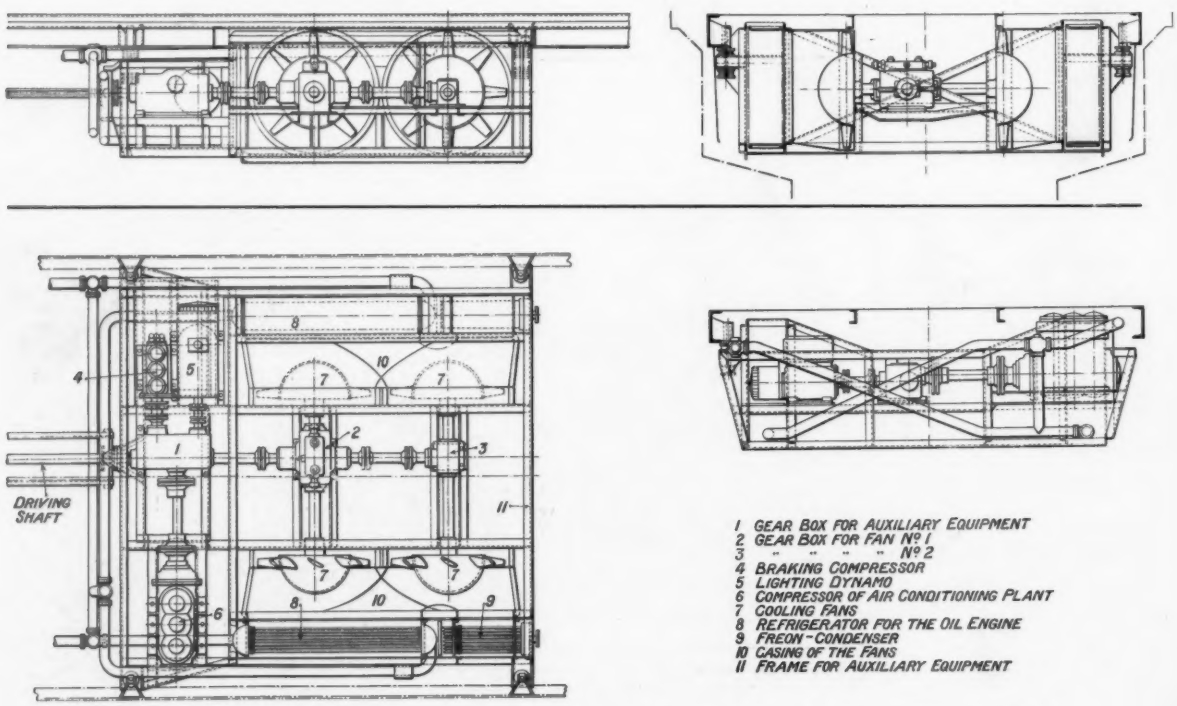
Egyptian 220 b.h.p. diesel railcar

from the track has been eliminated to a considerable extent. A 10-in. air brake cylinder of Knorr manufacture is mounted on each bogie, and by means of equalised levers applies two blocks to each wheel. Air sanding is applied to the outer sides of both sets of driving wheels, and is operated by compressed air taken from the Westinghouse brake system. Despite the large amount of power and transmission mechanism on the bogie, all the details are accessible.

The Body

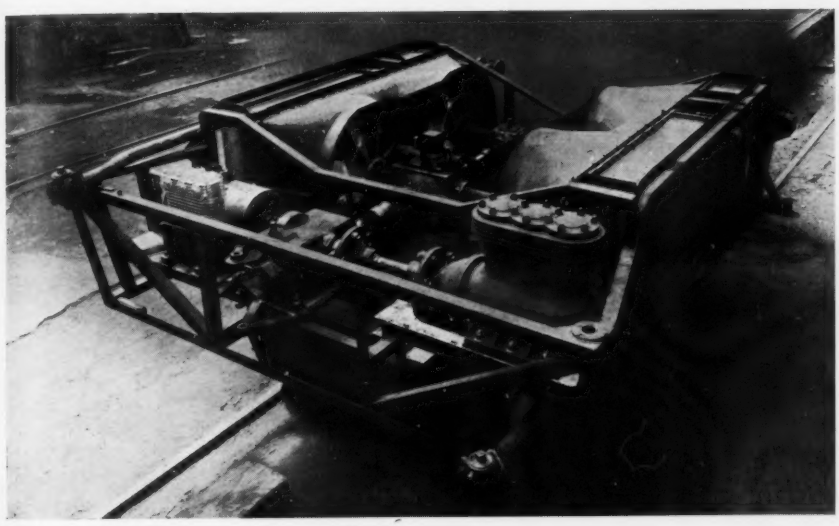
Electric welding and chrome steel have been used also in the fabrication of the body framing. The steel side panels have an outside silver-grey varnish and an interior lining of Alfol in order to assist in keeping the passenger saloons cool, an object which is attained mainly by the provision of air-conditioning apparatus with auxiliaries driven directly by the main engine, and not by the more usual electrical means, with a consequent saving in weight of 1½ to 2 tons. The operation of this Ganz air-conditioning system (which also cools the drinking water in the lavatory) is described in a separate article elsewhere in this issue. The car is lighted electrically, and the current for this comes from a 24-volt battery of 360 amp. hr. capacity; this also provides the current for the main engine starting motors, of which there are two. The lighting dynamo, brake air compressor, engine cooling water fans, and air-conditioning auxiliaries are mounted on a sub-frame below the centre of the car.

The first and second class saloons are fitted with comfortable curved-back seats with single arm rests, and covered in leather. The wall panels and transverse partitions are of polished mahogany plywood, and the windows are of special glass, raised and lowered by means of balanced crank handles. Silk curtains are hung on the insides of the windows, and protection from the sun's rays is obtained by aluminium louvres. Parcel racks are carried along the side walls at cantrail level and immediately below the air inlet ducts; the air outlet ducts are at the bottoms of the side walls.


DRIVING SHAFT
1 GEAR BOX FOR AUXILIARY EQUIPMENT
2 GEAR BOX FOR FAN Nº 1
3 " " " Nº 2
4 BRAKING COMPRESSOR
5 LIGHTING DYNAMO
6 COMPRESSOR OF AIR CONDITIONING PLANT
7 COOLING FANS
8 REFRIGERATOR FOR THE OIL ENGINE
9 FREON-CONDENSER
10 CASING OF THE FANS
11 FRAME FOR AUXILIARY EQUIPMENT

Arrangement of the engine, railcar, and air-conditioning auxiliaries on the Ganz railcars for Egypt

Welded body framing of high-tensile chrome-steel stampings. The length of the framing is 72 ft., and the width 9 ft. 6 in.



Arrangement of auxiliaries on subframe showing the Freon condenser for the air-conditioning apparatus at the end of the engine radiators, the two fans on each side being common to both. The air-conditioning compressor is in the right foreground, the auxiliaries gearbox in the middle foreground, and the brake compressor and lighting dynamo at the left

Interior of first and second class railcar showing the inlet ducts for the re-conditioned air below the ceiling, and in the floor the trapdoors for inspecting the auxiliary equipment

DETAILS OF THE DIESEL RAILCARS OF THE EGYPTIAN STATE RAILWAYS

XUM

TRANSMISSIONS FOR DIESEL LOCOMOTIVES AND RAILCARS

The A.L.M. Gearbox

By STUART MIALL, B.Sc.

THE illustration accompanying this article portrays in diagrammatic form a four-speed gearbox of French origin. From what follows it will be apparent that the box, which is a product of the Société de Construction d'Appareils de Levage, 78 Rue Vitruve, Paris, could easily be elaborated to give five, six, seven, or any other number of speeds.

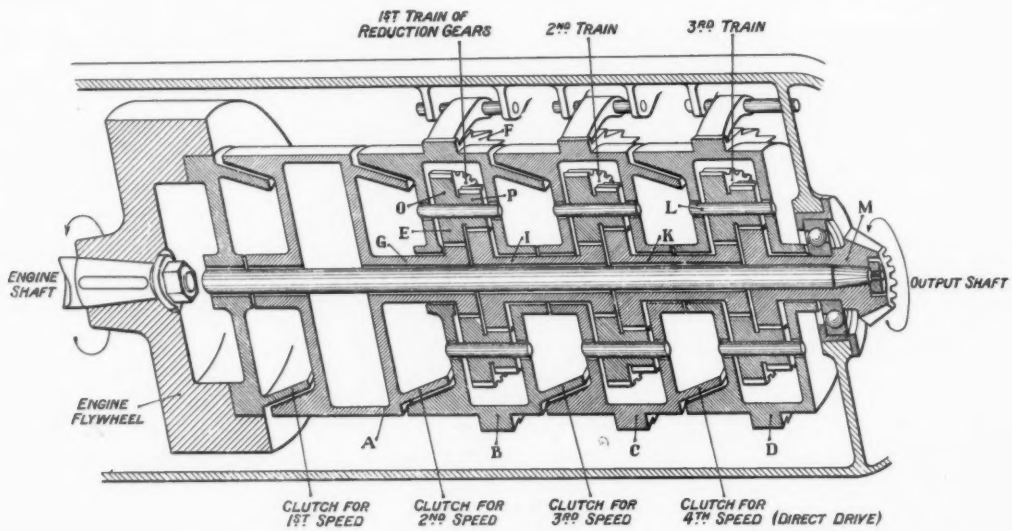
As shown, the gearbox consists of four elements *A*, *B*, *C*, *D*, corresponding to speeds 1, 2, 3, 4 respectively. Each element has a clutch capable of transmitting the full-load torque of the engine, while elements *B*, *C*, and *D* have in addition a train of gears such as *E* for speed reduction, and a ratchet wheel such as *F*. The last-named is for preventing rotation of the casing of the element in a direction opposite to that of the engine, and for transferring the reaction produced by the reduction gears, through pawls, to the stationary framework of the gearbox. In magnitude this reaction is equal to the difference between the tooth pressures of wheels *O* and *P*, referred to the radius at which the pawl acts on the ratchet. The direction of this reaction is backwards, *i.e.*, clockwise if viewed from the right.

The central shaft carries at its extremity the output bevel *M*, and it turns freely inside all the elements. The sleeves *I* and *K*, with two pinions each, are free on the central shaft, and in the casings through which they pass, and they transmit the drive from element to element, *i.e.*, from *B* to *C* and *C* to *D*.

Method of Operation

In the neutral position the four clutches are disengaged but clutch number 1 is engaged for first speed, making element *A* solid with the engine shaft. Sunwheel *G*, forming part of element *A*, engages the first reduction train which, through the sleeve *I*, is connected with the second train, and this in turn is connected through sleeve *K* with the third train. This last train actuates the output bevel *M*, and, if it be supposed that each reduction train has a ratio of 1·5 to 1, the total first speed reduction will be $1{\cdot}5 \times 1{\cdot}5 \times 1{\cdot}5 = 3{\cdot}375$ to 1.

For second speed clutch 2 is engaged. (Clutch 1 remaining engaged.) Casing *B* is in this way made solid with casing *A* and with the engine shaft, and because the spindle *L* now revolves at the same speed as *G*, the gears *O* and *P* of the first reduction train can no longer turn about their own common axis, but must serve simply as a claw for dragging round the central sleeve *I* at engine speed. The new ratio of reduction is $1{\cdot}5 \times 1{\cdot}5 = 2{\cdot}25$ to 1.



Diagrammatic arrangement of the A.L.M., or Applevage, gearbox

Clutch 3 is engaged for third speed, clutches 2 and 1 remaining engaged. Casing *C* then becomes solid with casing *B*, casing *A*, and the engine shaft, and sleeve *K* is forced to revolve at engine speed. Under the new conditions the third reduction train operates alone and the total ratio of reduction is 1·5 to 1.

Clutch 4 is engaged for fourth speed, clutches 3, 2 and 1 remaining engaged. Direct drive is now established, since *M* is forced to revolve at engine speed. With all four clutches engaged, elements *A*, *B*, *C*, *D*, and the central shaft carrying *M*, rotate *en bloc*, and the three ratchet wheels are carried round under their three pawls. The latter are all under load during the operation of first speed. During second speed operation the pawls of *D* and *C* are under load and in third speed only the pawl of *D* is under load.

It should be mentioned again here that the ratchets and pawls shown in the illustration are purely diagrammatic, their place being taken in practice by freewheels, self-wrapping band brakes, or any other suitable devices which are able to resist a torque in one direction without

giving rise to unbalanced lateral pressures on the central shaft. A single pawl would obviously tend to promote bending of this shaft.

Except in fourth speed, when the bevel *M* is solidly connected to the engine shaft, the A.L.M. gearbox gives a freewheel action, for, if the output bevel *M*, which is connected directly with the driving wheels of the vehicle, be overdriven by these wheels, the reactions on the spindles of the reduction train planet wheels (*e.g.*, on spindle *L*) are reversed in direction, so that the casings not clutched to the engine shaft, and normally at rest, are urged in the same direction of rotation as the engine. The pawls permit motion in this direction.

Advantages Claimed

Many advantages are claimed for the A.L.M. box and those which follow need no proof other than this description affords. (1) The gears are always engaged, being of the constant mesh variety. (2) While changing up from one speed to the next the propulsive effort is maintained. This is an important advantage. (3) A freewheel effect is secured in all speeds except the fourth or last one, so that when the vehicle is running with top or any other gear engaged it is possible to change suddenly into any lower gear, or into neutral, without changing the speed of the engine. The engine can accelerate at its own rate, or, if it be governed, continue to run at the original speed. With the engine governed to run at a fixed speed the vehicle will coast or freewheel after a change into a lower gear, and its speed will decrease until it reaches that at which the engine can again take up the drive. (4) The energy absorbed in clutch slip and converted into heat is divided between as many clutches as there are gears and so also is the wear. Each clutch slips only for the acceleration from one speed to the next. (5) For a given power to be transmitted the second, third and remaining elements can be identical in construction. The element of the first speed only differs in not having a reduction gear. (6) It is possible to obtain a large number of speeds from a given box by adding to the number of elements in cascade. The total reduction ratio R of a box so composed would be the reduction ratio r of one element raised to the power n-1, where n is the total number of speeds. Thus $R = r^{n-1}$. With identical elements the gearbox ratios form a geometrical progression, being r^{n-1}, r^{n-2}, r^{n-3}, . . r^3, r^2, r and 1 to 1. (7) It is a very simple matter to arrange for the remote control of the A.L.M. box, the operation being manual, electric, or pneumatic. It is also a simple matter to make the operation quite automatic, leaving the driver with only the engine throttle to manipulate.

A NEW USE FOR DIESELS

A special diesel tractor belonging to the engineering department of the P.L.M.

ANOTHER field of railway service for diesel units has been found by the delivery to the engineering department of the P.L.M. Railway of three *draisines*, or shunting tractors, designed specially for the use of permanent way maintenance gangs. The steel chassis is of a type similar to that employed for the standard wagons, and on it is mounted a central steel cabin containing a driving position and seats for 12 workmen. At one end of the cabin is a bonnet housing a 75-b.h.p. diesel engine, and at the other a platform for the carriage of stores and materials. The engine torque is transmitted through a five-speed gearbox giving speeds from 6 to 60 km.p.h. (3¾ to 37 m.p.h.). The radiator for the engine cooling water is of the gilled tube type and is mounted on the front of the bonnet. It is fitted with an engine driven fan.

The weight of a *draisine* is 9·5 tonnes, and standard buffing and drawgear is fitted to enable normal wagons to be hauled, and also to enable the *draisine* itself to be marshalled into a goods train if it has to make a long-distance journey. The haulage capacity on the level at 40 km.p.h. (24·8 m.p.h.) is 60 tonnes and 20 tonnes up 1 in 66 at 25 km.p.h. (15½ m.p.h.), but, of course, the capacity at low speeds is considerably greater. Westinghouse air brakes are provided and other fittings include a Klaxon horn, electric headlights, and guard irons at each end of the framing.

As the *draisine*-hauled trains, like that shown in the illustration, can distribute and collect such material as rails and sleepers, they are particularly useful in the engineer's yard, where they can handle material corresponding to 400 yd. of track a day. Moreover, as they have a capacity for hauling over 40 cu. yd. of miscellaneous material such as ballast and earth, they are suitable for use in relaying programmes and do away with the necessity of obtaining a service train. We have to thank the Editor of *Le Bulletin P.L.M.* for the above illustration and for much of the information.

XUM

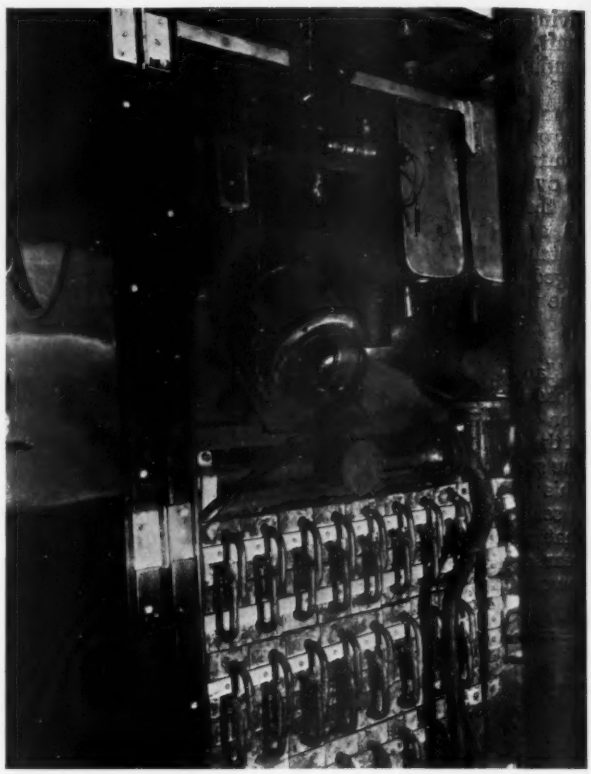
THE GANZ AIR-CONDITIONING SYSTEM

Equipment developed specially for railcars

THE ten diesel railcars now being delivered to the Egyptian State Railways, and described elsewhere in this issue, have their external walls lagged with Alfol to prevent the ingress of solar heat, and each car carries a vapour-compression refrigeration plant, using Freon (difluor-dichlor-methane), as the working substance, to cool and de-humidify the air in the passenger compartments. The capacity of the plant is 14-16,000 calories an hour and with an external temperature of 35° C., it will cool down the car interior 6 or 7 deg C. in 20 to 25 min. when the car has a full complement of passengers. The temperature inside the car is related automatically to the temperature outside, the control being arranged to give a zero temperature difference when the ambient temperature is 20 to 22 deg. C.

The principle of air-conditioning involves the use of a cooling agent which is compressed and then liquefied in a condenser, after which it is evaporated and picked up by the compressor to repeat the cycle. The heat necessary for the evaporation of the cooling agent is abstracted from the air circulated through the car by means of fans, the air itself being cooled in the process. During the cooling a great part of the humidity of the used air is precipitated. The renewal of the air is effected by drawing in through suitable filters a small proportion of outside air.

As shown in Fig. 1, the air-conditioning equipment is conventional so far as the thermal cycle is concerned. In this diagram the thick black lines indicate the passage of Freon in the vaporous, or mainly vaporous, condition, and the thin black lines indicate its passage in the liquid state. A high pressure prevails to the left of *A* round to *G* where throttling takes place. Beyond *G*, through *E* to *A* the pressure is lower. The evaporator, serving as an air-cooler, is installed in a special cabinet in the body of the railcar, and consists of a system of ribbed tubes through which the evaporating cooling agent flows. The circulating air is drawn over the coils of the evaporator by a fan and delivered through distributing ducts arranged along the sides of the passenger saloon ceilings. The used air is drawn off through ducts at the sides of the car floor.



Evaporator for air-conditioner mounted in cabinet in railcar body

Where the air-conditioning equipment in the Ganz cars differs from current practice is in the method of driving the compressor and the condenser fans. Instead of using electric power, which necessitates the use of heavy dynamos, motors, and storage batteries, and which offers

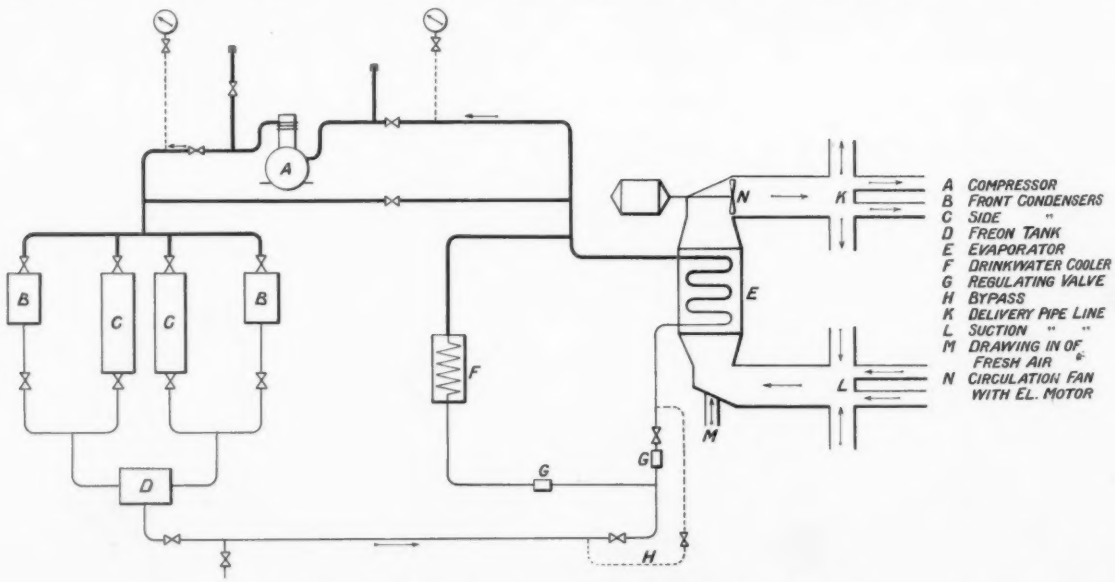


Fig. 1—Diagram illustrating the principle and working cycle of Ganz air-conditioner

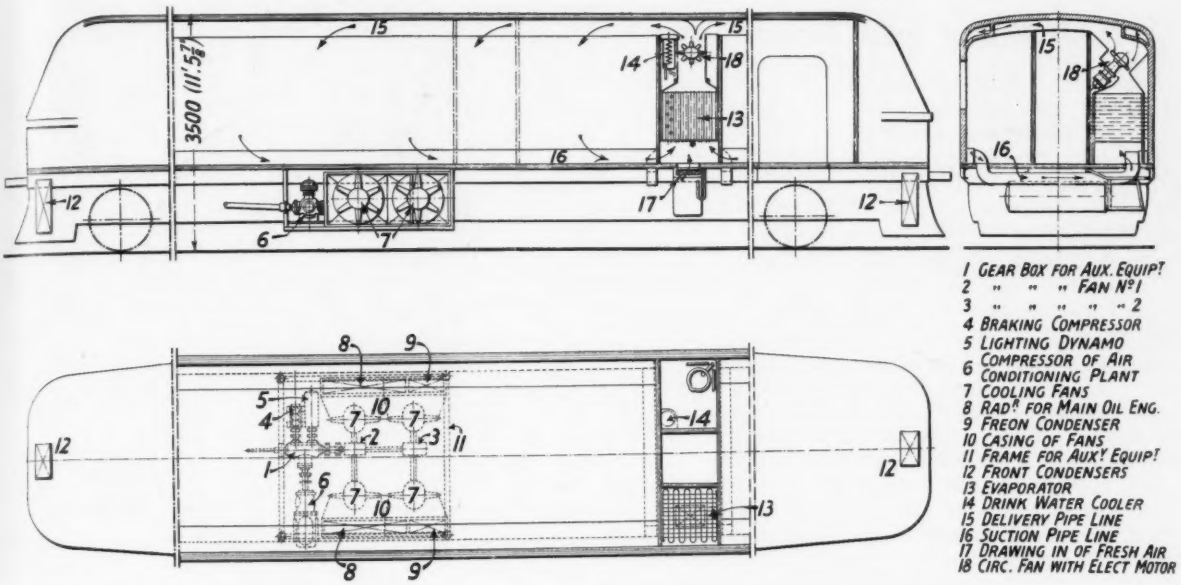

3500 (11'.5")
1 GEAR BOX FOR AUX. EQUIP?
2 " " " FAN N°1
3 " " " " " 2
4 BRAKING COMPRESSOR
5 LIGHTING DYNAMO
6 COMPRESSOR OF AIR CONDITIONING PLANT
7 COOLING FANS
8 RAD.R FOR MAIN OIL ENG.
9 FREON CONDENSER
10 CASING OF FANS
11 FRAME FOR AUX.Y EQUIP?
12 FRONT CONDENSERS
13 EVAPORATOR
14 DRINK WATER COOLER
15 DELIVERY PIPE LINE
16 SUCTION PIPE LINE
17 DRAWING IN OF FRESH AIR
18 CIRC. FAN WITH ELECT MOTOR

Fig. 2—Layout of air-conditioning equipment and certain engine auxiliaries on the diesel railcars of the Egyptian State Railways

the solitary advantage in trailer cars of being able to condition the air while the car is stationary, Ganz & Co. has developed a mechanical drive from the diesel engine. This drive has enabled a saving in weight to be made of about 60 per cent., compared with electrically-driven equipments, the air-conditioning plant weight being slightly under two tons in the Egyptian railcars. As the diesel engine can be kept running with the car standing, it is possible to maintain the auxiliary services, including the conditioning of the air, at all times.

From Fig. 2 it will be seen that the compressor and the condenser fans, with other auxiliaries, are connected through a gearbox and flexible cardan shaft to the gearbox and engine. The auxiliaries are mounted on a sub-frame attached through rubber blocks to the railcar underframe, and this arrangement was preferred to the alternative of carrying the auxiliaries on the bogies, as although this alternative would have obviated the need for a flexible cardan shaft drive, it would have introduced the much greater inconvenience of flexible pipe connections for high pressures. Moreover, it was prohibited by that lack of space which is a feature of most railcars.

A.T.C. for Diesel Vehicles

THE Union Pacific's high-speed, six-car streamlined train M-10001, for trans-continental service, (see the issue of this Supplement for December 28, 1934), is equipped with automatic train control, including cab signals, of the continuous-inductive type. As on other trains, this control will be effective with speed control. West of Omaha, however, between North Platte, Neb., and Cheyenne, Wyo., cab signalling will take the place of locomotive train control, to conform with the type of equipment installed in that section. That change is effected through the medium of a cut-out cock, situated in the engine room, and a token key. The equipment cannot be cut out unless the key is in its lock; nor can the key be withdrawn from the lock while the cock is in the cut-out position.

The mechanism of the speed governor is driven by a bevel gear, which may be disengaged by moving a hand lever. The governor cut-out lever is to save needless wear of the gear mechanism when the train is running outside train-controlled territory. Should the driver omit to cut in the governor mechanism before moving the cut-out cock to the cut-in position, the brakes are applied, and cannot be released until the governor mechanism is cut in, or until the cut-out cock is moved to the cut-out position.

Prior to a run on train-controlled track, the driver moves the cut-out cock to cut-in and removes the token key, thus locking the cut-out cock in the cut-in position. The guard takes charge of it during the journey, to assure that the train control equipment is in action. When the train enters cab-signal territory the token key is replaced in the lock, the cut-out cock is moved to the cut-out position, and the governor driving gear is disengaged. Whenever the A.T.C. equipment is inactive, the key must remain in the cut-out cock. The cab signalling and train-control equipment of the M-10001 was supplied by the Union Switch & Signal Company.

UNION PACIFIC IMPROVEMENTS.—The day coaches of the *City of Portland*, the 1,200 b.h.p. rebuild of the 900 b.h.p. Los Angeles to New York record breaker, have been filled to capacity since the train began to run on its 57 m.p.h. schedule between Chicago and Portland (Oregon), 2,272 miles. For service between Chicago and California, two 11-car trains are being built. The first will have one 1,200 b.h.p. engine and the 900 b.h.p. unit taken out of the *City of Portland*, giving a total of 2,100 b.h.p. The second train will have two 16-cylinder Winton engines of 1,200 b.h.p. each, of the type which is to be built in numbers at the new mass-production plant at McCook.

XUM

Notes and News

Sorocobana Possibilities.—The Sorocobana Railway of Brazil is now considering alternative tenders for steam and diesel metre-gauge shunting locomotives.

Brazilian Diesel Extension.—The Mogyana Railway is to put into service four metre-gauge diesel railcars, the engines and complete hydraulic transmissions for which are to be supplied by Leyland Motors Limited.

Greek Diesel Inquiry.—It is understood that the Piræus-Athens-Peloponnessus Railway has decided to invite international tenders for 16 metre-gauge diesel railcars, eight for express service and eight for local traffic.

B.A.P. Railcars.—Two 130 b.h.p. oil engines, hydraulic torque converters and controls are being supplied by Leyland Motors Limited, to the Birmingham Railway Carriage & Wagon Co. Ltd. for installation in two railcars for the Buenos Ayres Pacific Railway.

P.L.M. Experiment.—Trials with a Renault diesel car fitted out as a parcels van are being conducted by the P.L.M. Railway. Parcels vans or wagons up to a trailing load of 60 tons can be hauled, and it is anticipated that a diesel train of this type may eventually supersede numerous local goods trains.

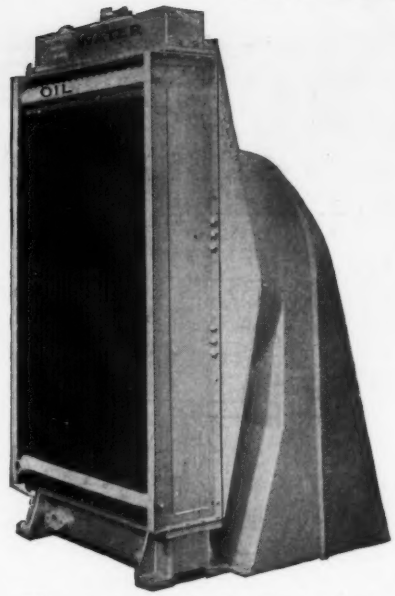
Another Bagnall Locomotive.—W. G. Bagnall Limited, of Stafford, has just completed a 70 b.h.p. metre-gauge diesel-mechanical locomotive for the Assam Railways & Trading Co. Ltd. It is similar, but larger, to the 50 b.h.p. locomotive built by Bagnall in 1934, for the same railway, and described in the issue of this Supplement for May 18 of that year, and follows the successful performance of the latter machine.

New Sulzer Engines.—The first units to the new design of 500 b.h.p. Sulzer engine, whose intended installation in four trains of the South Manchuria Railway was mentioned in the issue of this Supplement for April 19, have now arrived at Dairen. These engines are lighter than the previous Sulzer types, and run at 900 r.p.m. They have a welded steel bedplate which also supports the attached main generator when electric transmission is used.

Another Mexican Diesel.—Yet another small narrow-gauge diesel locomotive has been ordered from the Drewry Car Co. Ltd., by the Eagle Oil & Shipping Co. Ltd. for service on its Mexican estates. This locomotive will be powered by a Gardner engine and equipped with the Wilson-Drewry epicyclic transmission working in conjunction with a Vulcan-Sinclair traction-type hydraulic coupling. The Drewry Car Company also has in hand a passenger railcar to the order of the War Office.

Fuel Testing.—Shell-Mex & B.P. Limited is showing on its stand at the Shipping & Machinery Exhibition a Sunbury electrical indicator coupled to a C.F.R. (Coöperative Fuel Research) fuel testing engine. The Sunbury electrical indicator has been developed in the Research Laboratory of the Anglo-Iranian Oil Co. Ltd. for investigating the characteristics of diesel fuel, such as ignition delay period, and on the Shell-Mex stand phenomena in the engine are shown through the medium of a cathode ray oscillograph.

Radiators for Diesels.—The combined water and oil cooler of the gilled tube type, illustrated on this page, is being exhibited at the Shipping, Engineering and Machinery Exhibition by the Spiral Tube & Components Co. Ltd., which company has numerous similar installations fitted to diesel locomotives and railcars. The exhibit itself is one of 22 units built for use in conjunction with 125 b.h.p. engines to be incorporated in 11 railcars now being built for the Entre Rios Railway by the Birmingham Railway Carriage & Wagon Co. Ltd.



Oil and water cooler for diesel railcar

Zephyr Performance.—The original Burlington Zephyr, now a four-car train instead of three, has covered 140,000 miles since April 18, 1934, when it was delivered from the builders. Included in this total are 25,771 miles while on exhibition, and 1,015 miles on the occasion of its non-stop run from Denver to Chicago at an average of 77·6 m.p.h. The two newest Zephyrs, on the Chicago-Twin Cities run, have been filled to capacity since they went into service, and since June 2 the desired bookings have exceeded the capacity by 26 for each journey in both directions daily.

Further Irish Progress.—The Great Northern Railway of Ireland is building an articulated diesel train for the Belfast suburban service. It will consist of three vehicles, of which the short centre unit will be the power and equipment car ; the end vehicles will seat a total of 160 passengers. The engine will be of Gardner manufacture, of 150 b.h.p., and the complete power bogie will be made by Walker Bros. (Wigan) Limited, as in previous G.N.R. (I) railcars. A Wilson epicyclic gearbox and a Vulcan-Sinclair hydraulic coupling will be incorporated. The mechanical portion of the car is being built at Dundalk works.

German Flyers.—In addition to the Flying Hamburger, the German State Railways now has regular super-speed daily return services between Cologne and Berlin and Frankfürt and Berlin. The Fliegende Kölner (inaugurated on July 1) starts at 7.0 a.m. and reaches Berlin at 12.20 p.m., returning from Berlin at 7.11 p.m. and arriving in Cologne at 12.18 a.m., giving overall average speeds of 67·5 m.p.h. up (including seven intermediate stops) and 70·5 m.p.h. down (including six stops). In the course of the down trip the 157·7 miles from Berlin (Zoo) to Hanover are covered at a start-to-stop average of 82·3 m.p.h., the fastest booked run in the world. The Fliegende Frankfürter (inaugurated on August 15) leaves at 6.40 a.m. and reaches Berlin, 335 miles, at 11.46 a.m. after making three stops. On the return journey Berlin is left at 6.24 p.m. and Frankfürt reached at 11.29 p.m. after four stops. On the up journey the average speed over the 102·3 miles from Leipzig to Berlin are covered at an average of 80·9 m.p.h. Further particulars of these lightning schedules will be found in the April 19 issue of this Supplement.